SHORT TERM ASSESSMENT OF
FUNCTIONAL RESULTS OF BIPOLAR HIP ARTHROPLASTY

Dissertation submitted for
M.S. Degree Examination

Branch II - ORTHOPAEDIC SURGERY

DEPARTMENT OF ORTHOPAEDIC SURGERY
MADRAS MEDICAL COLLEGE, CHENNAI – 3

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI.

MARCH 2007

CERTIFICATE

*This is to certify that this dissertation entitled "***SHORT TERM ASSESSMENT OF FUNCTIONAL RESULTS OF BIPOLAR HIP ARTHROPLASTY***" is the bonafide work done by* **Dr.VIKRAM.M.,** *under my direct guidance and supervision in the Department of Orthopedic Surgery, Madras Medical College, Chennai-3 during his period of study from July 2004 - February 2007.*

Prof. MAYILVAHANAN NATARAJAN
M.S.Orth (M'as), M.Ch Trauma (L Pool), Ph.D (Orth. Onco)., DSc.,(Orth)
Professor & Head of the Department,
Department of Orthopedic Surgery,
Madras Medical College, Chennai – 3.

Dr. KALAVATHY PONNIRAIVAN
B.Sc., M.D. (Bio)
DEAN,
Madras Medical College, Chennai – 600 003

ACKNOWLEDGEMENT

My sincere thanks and gratitude to ***Dr. KALAVATHY PONNIRAIVAN*** **B.Sc., M.D.,(Bio),** *Dean, Madras Medical College, for permitting me to utilize the clinical materials of this hospital.*

I have great pleasure in thanking my teacher and guide ***Prof. MAYILVAHANAN NATARAJAN*** **M.S. Ortho (M'as), M.Ch Trauma (L Pool), Ph.D (Ortho. Onco)., DSc.(Orth0),** *Professor & Head of the Department, Department of Orthopedic Surgery, Madras Medical College for permitting me to use the clinical materials and for his valuable advice and encouragement in preparing this dissertation.*

I am very much grateful to ***Prof. R.H. GOVARDHAN M.S.Ortho., D. Ortho,*** *Additional Professor, Department of Orthopedic Surgery for his valuable advice and guidance that he has provided me throughout this study.*

I am thankful to ***Prof. K. ANBAZHAGAN M.S.Ortho., D. Ortho,*** *Additional Professor, Department of Orthopedic Surgery for his valuable support and guidance.*

My sincere thanks and gratitude to ***Prof. V. THULASI RAMAN M.S.Ortho., D. Ortho,*** *Additional Professor, Department of Orthopedic Surgery for his constant advice and guidance provided during this study.*

I am very much grateful to Retired ***Prof. R. DHANAPAL, M.S.Ortho., D.Ortho,*** *for his valuable support and guidance that he has provided me throughout this study.*

My sincere thanks to ***Dr.R.Selvaraj, Dr. Nalli R.Uvaraj, Dr.R.Subbiah, Dr.V.Mazhavan, Dr. B.Pasupathy, Dr.T.R.Ramesh Pandian, Dr.Thanmaran, Dr.M.Antony Vimalraj, Dr.S.Karunakaran, Dr.Nalli R.Gopinath*** *and* ***Dr.K.Velmurugan*** *for their suggestion and help during my study.*

I am also thankful to all my colleagues and staff members of the Department of Orthopedics and Traumatology who helped me in all possible ways.

Last but not least, my sincere thanks to all our patients for their co-operation in conducting this study.

CONTENTS

INTRODUCTION

Bipolar hip arthroplasty is done using a low friction, total prosthesis that has motion at two bearings unlike the conventional unipolar prosthesis.

The advantages of bipolar hip arthroplasty are better stability, rapid rehabilitation and reduced acetabular erosion on long term.

Bipolar is indicated in younger and older age groups. It provides excellent functional results in fracture neck and trochanter of femur in older age group and chronic arthritis and osteonecrosis of femoral head in younger age group. It has extended use in tumor surgery and revision total hip Arthroplasty.

Bipolar in fractures of neck and trochanter provides better pain relief, allows early rehabilitation and ambulance of older individuals thereby preventing complications of prolonged convalescent period.

In younger individuals, bipolar hip arthroplasty provides an excellent functional result in chronic arthritis and osteonecrosis of femoral head.

The movements in the inner and outer bearing are complementary to each other and thereby providing increased range of motion post operatively. Availability of wide range of sizes, wide spectrum of use from simple fractures to complex revisions and flexibility between cemented and uncemented procedures confirms it as one of the best prostheses.

Since it has the best chances of long term success, it should be done with utmost technical precision. Proper patient selection, implant selection and implantation are very essential for the successful outcome of the surgery. This study was done to assess the short-term function of bipolar hip arthroplasty prospectively during last 3 years.

AIM OF THE STUDY

The aim of this study is to assess the short-term functional outcome of 60 cases of bipolar hip arthroplasty surgeries done in our institution during the period July 2004 to September 2006.

HISTORICAL REVIEW

Application of the principles of LOW FRICTION ARTHROPLASTY to the hip has received wide acceptance. Sir John Charnely's pioneering work of including the acetabulum in reconstruction and the introduction of methyl methacrylate remains significant contribution.

Not all of these have the extensive deformity of both femoral head and the acetabulum for which a DUAL-ASSEMBLY total hip prosthesis has been most successful.

The application of the low friction principle in the fractures of femoral neck is achieved without removing or distorting the acetabulum. This led to the invention of the single assembly prosthesis.

HISTORY OF ARTHROPLASTY:

In 1953, Haboush reported double cup or surface replacement arthroplasty, in which two metallic cups were fixed with acrylic cement, one onto femoral head and one into the acetabulum.

In 1977, Townley began to use polyethylene acetabular components. Although there was an early enthusiasm, an unacceptable number of failures became evident in the first 5 years following this surface replacement arthroplasty.

The Austin-Moore’s prosthesis and Thompson’s prosthesis provided promising results in early follow-ups. However the problem of erosion of acetabular surface with recurrence of pain in the hip became inevitable.

Sir John Charnley began the development of various types of total hip replacement arthroplasties between 1958 and1963. His development of Low Friction arthroplasty (LFA) led to dramatic improvements in the function and durability of total hip replacement.

In 1974, John Bateman invented the low friction, total or single assembly prosthesis.

DESCRIPTION OF IMPLANT:

A completely mobile head element and addition of another head surface for the motion in the acetabulum create a compound system providing for a greater distribution of bearing forces minimizing wear and tear changes both in implant and acetabulum.

The prosthesis is made of COBALT-CHROMIUM alloy (Vitallium). It consists of:

1. femoral stem with collar and neck
2. 22mm spherical bearing
3. bearing insert made of Ultra High Molecular Weight Polyethylene

4. Metallic cup, the head.

The assembled system resembles an integrated bearing system for hip joint but it is fixed to the femoral stem.

The prosthesis has undergone changes in its design since its introduction in 1974.

Different lengths in the neck offsets and in the stem lengths has provided for wide range of prostheses to suit different patients. Long and short necked prosthesis, one 0.25 inches longer than the other, is appropriate for use in case of deep acetabulum or in patients with limb length discrepancy.

The conventional prosthesis with a stem length of 153mm is used in the cemented version. For young individuals and in osteoporotic bones, the straight, long stemmed prosthesis (305mm) is ideal in providing the three point fixation. The concept of biomechanical fixation includes biological fixation by bone ingrowths through the fenestration in the proximal neck. It is mechanical by a snug fit in the isthmus and by three point fixation within the shaft. The removed femoral head is morsellized in the bone mill and packed into the prepared femoral canal to enhance tight fit.

ANATOMY

The hip joint is a classical ball and socket joint created by the articulation of the head of the femur with the concave socket of the acetabulum. The acetabulum is created by the confluence of the ilium, the ischium, and the pubis. The articular surface of the acetabulum presents a horseshoe like surface with a central, inferiorly directed notch that contains the pulvinar, a fat cushion covered with synovium. The articular cartilage of both the femur and the acetabular surfaces is thicker peripherally and thinner centrally. The opposing surfaces are regularly and reciprocally curved, but at any given time only two fifths of the femoral head occupies the acetabulum.

The hip joint is a diarthrodial synovial joint with synovial membrane lining the anterior neck of the femur to the intertrochanteric line but only the medial half of the posterior neck. The joint is covered by a capsule, made up of outer longitudinal and inner circular fibers, anteriorly the thick iliofemoral ligament of Bigelow, posteriorly the thinner ischiofemoral ligament, and inferiorly the pubofemoral condensation.

Characteristic vascular patterns feed the hip. Rich subsynovial anastomoses occur at the margins of the articular cartilage. Pericapsular vessels are seen at the attachment of the capsule at the acetabulum and enclose anastomoses from the femoral circumflex artery, acetabular branches of the obturator artery and articular branches of the superior gluteal artery.

MUSCLES PRODUCING THE MOVEMENTS

Flexion

Psoas major and iliacus assisted by pectineus, rectus femoris and sartorius.

Extension

Gluteus maximus and hamstring muscles.

Adduction

Adductors longus, brevis and magnus assisted by pectineus and gracilis.

Abduction

Glutei medius and minimus assisted by tensor fasciae latae and sartorius.

Medial Rotation

Tensor faciae latae and anterior fibers of gluteus medius and minimus.

Lateral Rotation

Obturator muscles, gamelli and quadratus femoris assisted by piriformis, gluteus maximus and sartorius.

BIOMECHANICS

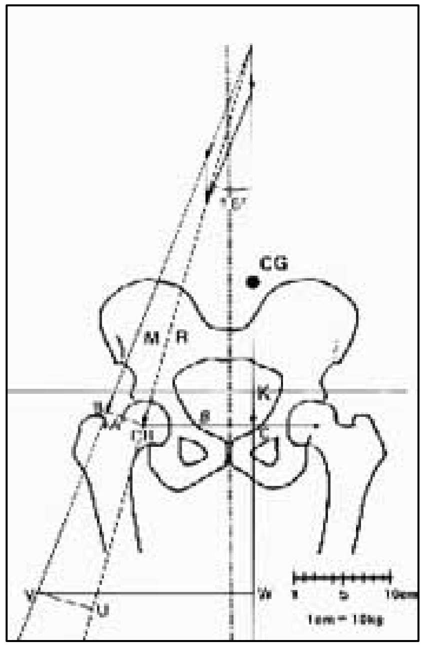
BIOMECHANICS OF THE NORMAL HIP

It is important to the success of total hip arthroplasty that one understands the factors influencing both the direction and magnitude of forces acting upon the femoral head. The forces exerted on the hip have their biological expression in the form of the femur and acetabulum, particularly in the location and orientation of the trabecular pattern. The forces exerted on the prosthetic femoral head in a properly performed total hip replacement will be very similar in both direction and magnitude.

Of all the species in the animal kingdom, only birds and man habitually use a bipedal gait. Even the larger primates use a quadripedal ambulation mode for most of their activity. When the weight of the body is being borne on both legs, the center of gravity is centered between the two hips and its force is exerted equally on both hips. Under these loading conditions, the weight of the body excluding the weight of both legs is supported equally on the femoral heads, and the resultant vectors are vertical.

When the hips are viewed in the sagittal plane and if the center of gravity is directly over the centers of the femoral heads, no muscular forces are required to maintain the equilibrium position, although minimal muscle forces will be necessary to maintain balance. If the upper body is leaned slightly posterior so that the center of gravity comes to lie posterior to the centers of the femoral heads, the anterior hip capsule will become tight, so that stability will be produced by the Y ligament of Bigelow. Therefore, in symmetrical standing on both lower extremities, the compressive forces acting on each femoral head represent approximately one-third of body weight.

In a single leg stance, the effective center of gravity moves distally and away from the supporting leg because the non supporting leg is now calculated as part of the body mass acting upon the weight-bearing hip. Since the pillar of support is eccentric to the line of action of the center of gravity, body weight will exert a turning motion around the center of the femoral head. This turning motion must be offset by the combined abductor forces inserted into the lateral femur. In the erect position, this muscle group includes the upper fibers of the gluteus maximus, the tensor fascia lata, the gluteus medius and minimus, and the pyriformis and obturator internus. The combined resultant vector of the abductor group can be represented by the line of action M. Since the effective lever arm of this resultant force (BO) is considerably shorter than the effective lever arm of body weight acting through the center of gravity (OC), the combined force of the abductors must be a multiple of body weight. The vectors of force K and force M produces a resultant compressive load on the femoral head that is oriented approximately 16° obliquely, laterally, and distally. The orientation of this resultant vector is exactly parallel to the orientation of the trabecular pattern in the femoral head and neck.

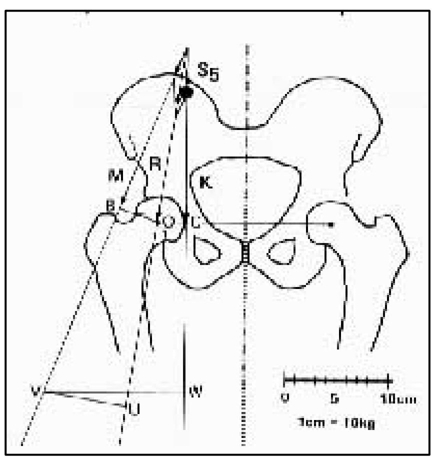


FORCES ACTING ON THE HIP IN A SINGLE LEG STANCE. G- CENTER OF GRAVITY; M- MUSCLE FORCES; K-EFFECT OF PARTIAL BODY WEIGHT; R-RESULTANT VECTOR.

A-P X-RAY OF A NORMAL HIP SHOWING THE COMPRESSION TRABECULAE ORIENTED PARALLEL TO THE RESULTANT COMPRESSIVE LOAD ON THE FEMORAL HEAD.

The effect of this combined loading of body weight and the abductor muscle response required for equilibrium results in the loading of the femoral head to approximately 4 times body weight during the single leg stance phase of gait. This means that in normal walking the hip is subjected to wide swings of compressive loading from one-third of body weight in the double support phase of gait to 4 times body weight during the single leg support phase. The factors influencing both the magnitude and the direction of the compressive forces acting on the femoral head are 1) the position of the center of gravity; 2) the abductor lever arm, which is a function of the neck-shaft angle; and 3) the magnitude of body weight. Shortening of the abductor lever arm through coxa valga or excessive femoral anteversion will result in increased abductor demand and therefore increased joint loading. If the lever arm is so shortened that the muscles are overpowered, then either a gluteus minus lurch (the center of gravity is brought laterally over the supporting hip) or a pelvic tilt (Trendelenburg gait) will occur.

Since the loading of the hip in the single leg stance phase of gait is a multiple of body weight, increases in body weight will have a particularly deleterious effect on the total compressive forces applied to the joint. The effective loading of the joint can be significantly reduced by bringing the center of gravity closer to the center of the femoral head (Figure 1.26). Sideways limping, however, requires acceleration of the body mass laterally, its deceleration during the stance phase of gait, and then its acceleration back to the midline or even to the other side as the single leg stance phase changes to the opposite extremity. This requires considerable energy consumption and is a much less efficient means of ambulation than the normal situation in which the hip is subjected to these considerable forces. Another effect of sideways limping is that the resultant vector becomes more vertical because the center of gravity is acting in a more vertical direction, and therefore the bending moment of the femoral neck is increased.



FORCES ACTING ON THE HIP WITH SIDEWAYS LIMP, THE REDUCTION OF VECTOR M AND R EVEN THOUGH K IS UNCHANGED. R IS ALSO MORE VERTICALLY ORIENTED.

Another mechanism for reducing the resultant load on the femoral head is the use of a walking stick in the opposite hand. Since some of its force is transferred to the walking stick through the hand, the effective load of body weight is thus reduced in two ways: 1) the effective load of body weight is reduced; 2) since the turning moment around the femoral head is reduced, the abductor demand is also reduced.

INFLUENCE OF A WALKING STICK ON FORCES ACROSS THE HIP

	Pressure of stock (kg)	Static load across the hip(kg)	Angle in inclination from the vertical of the compression force on the femoral head
R	0	17.5	16°
1	9	100	13°
2	15	51.2	8°
3	17.5	30.26	0°

The total compressive load on the femoral head and the angle of inclination of the vertical compressive loads for different forces, are applied to the walking stick. It can be that only 9 kg of force applied to a cane in the opposite hand reduces the load on the femoral head by nearly 40%.

The same effect could also be achieved by a 40% reduction in body weight. Also the angle of inclination with this degree of unloading is not significantly different from normal, so that using a stick to unload the femoral head produces lower bending forces around the femoral neck than sideways limping. Therefore, in the rehabilitation of patients after total hip arthroplasty, the use of a stick to prevent sideways limping is always preferable.

The form of the femur and the orientation of the trabecular pattern in the proximal femoral metaphysis and epiphysis would support the conclusion that the principal loading of the femoral head is in the coronal plane. However, there is another manner of loading that also has clinical relevance to total hip arthroplasty and may also play a significant role in loosening. When an individual rises from the seated position or climbs stairs, the forces of body weight are applied to the anterior surface of the femoral head. The femur itself is prevented from rotating in response to this applied load by the stabilization of the posterior femoral condyles against the tibial plateaus. In addition, the psoas tendon inserting into the lesser trochanter prevents this applied load from rotating the femur internally. This anteriorly applied force therefore produces a twisting strain on the proximal femur. That this must be so is demonstrated in two Charnley total hip femoral stems that were recovered after failure through loosening. In both instances, the distal portion of the prosthesis remained fixed in the diaphysis while the proximal cement mantle loosened. Although both specimens had deformed into varus, they both also had deformed more in retroversion. The more deformed of the two specimens was from a 40-yr-old postal worker who had a total hip replacement for avascular necrosis and returned to work as a postman, which required frequent squatting and lifting of packages.

This aspect of loading of the proximal femur takes on particular importance for femoral stem design, since anteriorly applied loads will produce a twisting strain on the stem within the medullary canal. Vertical loading of the femoral component will produce compressive load on the medial side of the femoral stem and tension loads on the lateral side of the stem, whereas anterior loading will produce shear stresses at the prosthesis-bone-cement interfaces. Since smooth stems are capable of transmitting load only in compression, this latter mode of loading is an argument for fixation that has the capability of transmitting all three mechanisms of stress: compressive, tensile, and shear. It also implies that it is inadequate to analyze the validity of femoral stem design by only simulating vertical load and that the resistance to twisting moments within the femoral canal also requires analysis.

FORCES ACTING ON THE ACETABULUM

Many more detailed analyses of the biomechanics of the hip have been directed toward the study of stress within the femoral stem than within the acetabulum. However, in the long-term follow-up of Charnley’s prosthesis, acetabular loosening has been an important problem. The intact acetabulum is a horseshoe form that wraps around the superior, anterior, and posterior aspects of the slightly eccentric femoral head. In the lightly loaded state, the dome of the acetabulum is relatively unloaded, and the stress is transferred from the femoral head to the acetabulum through the anterior and posterior extensions of the horseshoe. As the load is progressively applied, since the acetabulum is not in continuity inferiorly, the anterior and posterior sides of the horseshoe are free to expand so that a more congruous seating of the femoral head is allowed. As Radin has pointed out, this phenomenon of deformation under load leads to increasing congruity with progressive loading. If the hip were fully congruent in the acetabulum, full loading would produce incongruence as the anterior and posterior extensions of the horseshoe would separate away from the femoral head on loading. This deformation of the acetabulum under load has relevance to total hip arthroplasty since loading of a deformable polyethylene cup could lead the polyethylene to separate from the acetabulum due to the deformability of both materials.

The analysis of the forces acting on the femur also applies to the acetabulum. The orientation of the resultant vector passing through the acetabulum should pass through the center of the body of the ilium. If there is protrusio acetabuli, then this force will pass through the medial wall, which will ultimately fail with progression of the protrusio. If the vector is lateralized, or the acetabulum is dysplastic, subluxation and lateral acetabular hip erosion may occur.

Vasu, Carter, and Harris have analyzed the distribution of stresses in the acetabulum before and after total hip replacement, using finite element analysis. In the normal hip they found transmission of compressive stresses by the cancellous bone of the body of the ilium to the lateral acetabulum wall and lesser order tensile stresses to the medial wall. After conventional total hip replacement, the compressive stresses in the cancellous bone immediately above the cup were increased, as well as tensile and compressive stresses in the medial wall. Stresses in the lateral wall were decreased. Adding metal backing to the cup redistributed the stresses throughout the whole acetabulum so that stress in the cancellous bone was reduced

BIOMECHANICS IN BIPOLAR:

The success in hip joint replacement is based on the effective application of WOLFF'S law.

A self aligning system for long term use obviates the problem of obtaining the functional alignment of the acetabular component at the time of operation and conforms to WOLLF'S law.

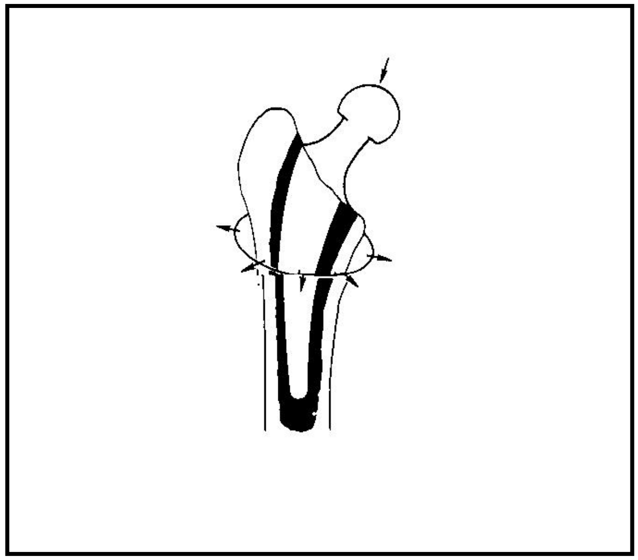
TOTAL PROSTHESIS PRINCIPLE:

The prosthesis locks the implant together without acetabular fixation.

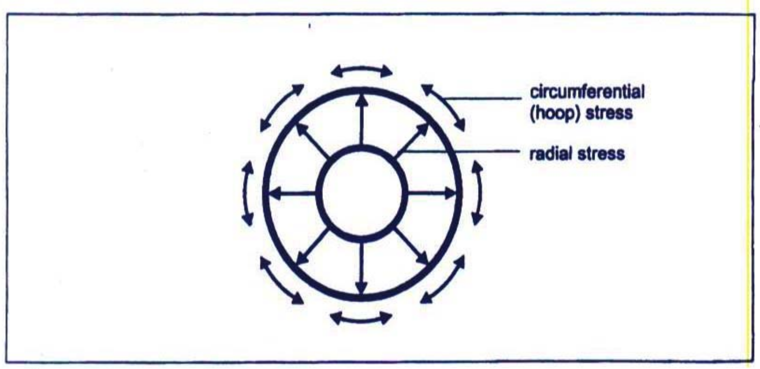
1. head stability
2. insulation of metal-bearing elements
3. motion range
4. bearing seat strength
5. Stem contour and length.

Rotational stability of the stem can be increased both proximally and distally. Increasing the width of the proximal portion of the stem to better fill the metaphysis increases the torsional stability of the femoral component.

Modifications of the distal portion of the stem may add to rotational stability as well. Longitudinal cutting flutes and extensive porous coatings that “scratch” the diaphyseal endosteum improve rotational stability in the absence of cement.



HOOP STRESSES



DIRECTION OF RADIAL AND TENSILE HOOP STRESSESS IN A HOLLOW CIRCULAR STRUCTURE

LOAD TRANSFER IN CEMENTLESS STEMS

Cementless stems with no surface coating rely on a good press fit in the bone. If the fit is not good, the stem will subside. The press fit promotes hoop stresses in the bone which reduces stress shielding. Early stems were smooth but were not successful because the bone shape did not match the stem shape well enough, so many subsided or loosened.

Cementless stems are now surface coated usually with hydroxyapatite. Some are coated all over which helps bone ingrowths and potentially eliminates metal debris. It also gives the opportunity for the bone to contact a larger area of the stem which lessens the chance of failure of the bond under subsequent loading. However, fully coated stems promote stress shielding of the bone. The optimal amount of coating is not really known.

Lack of distal contact in cement less stems is known to be a cause of thigh pain. Custom made plastic sleeves are therefore sometime used to provide good distal contact to reduce thigh pain. It is generally agreed now that distal anchoring of the stem does not affect proximal stress shielding.

THE EFFECT OF FEMORAL SHAPE ON LOAD TRANSFER

All stems are tapered to prevent subsidence and many, especially the cement less ones, have a proximal wedge so that the stem can rest on the bone, allowing transmission of compressive forces as well as shear forces.

The shape of the stem is very important in cement less femoral implants because the stem needs to contact a large proportion of the femur. If its outer dimensions at any point along its length are smaller than the corresponding inner dimensions of the medullary canal, there will be gap that can happen. In Figure A, the stem has a greater curve than that of the femur so has poor medial contact with it. In Figure B the stem fits proximally but not distally because it’s taper is too greater for the bone. Careful stem selection overcomes most potential shape problems, but the range of shapes and sizes offered in a commercial hip system may not always be adequate to cover a wide range of femurs.

JOINT WEAR

Wear can be defined as the loss of material from the surfaces of the prosthesis as a result of motion between those surfaces. Material is lost in the form of particulate debris.

There are three main types of wear that occur between bearing surfaces.

- Adhesive wear
- Abrasive wear
- Fatigue wear

The factors that determine wear are (1) the coefficient of friction of the materials and their surface finish (2) the hardness of the materials (3) the applied load (4) the sliding distance for each cycle and (5) the number of cycles that occur over time.

Adhesive wear

Adhesive wear occurs because the two bearing surfaces stick to each other when they are pressed together and one, usually the softer one, is torn off by the harder one. Bearing surfaces should, therefore, be made up of materials that have a low level of adhesion. Lubricants provide a layer between the two materials which reduces wear.

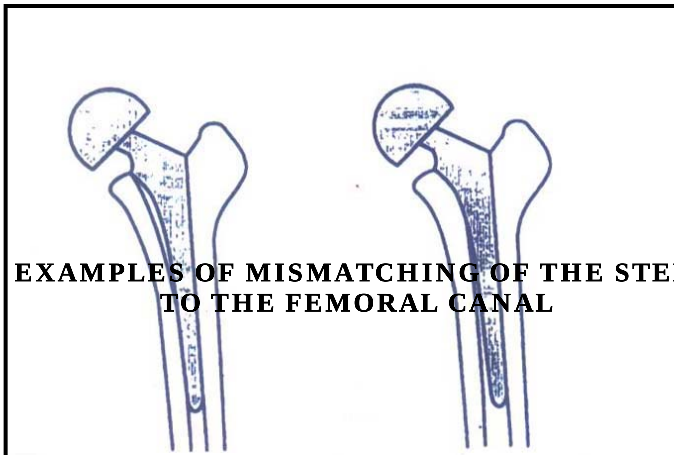
Abrasive wear

Abrasive wear occurs because surfaces are not perfectly smooth. Bearing surface, that need to endure heavy loads under many cycles of loading, such as hip joint replacements, must have highly polished surfaces, with a typical surface roughness of 0.3 microns so as to minimize abrasive wear. Good circulation of lubricant is important so that wear particles can be removed and not rub against the bearing surfaces causing even more wear.

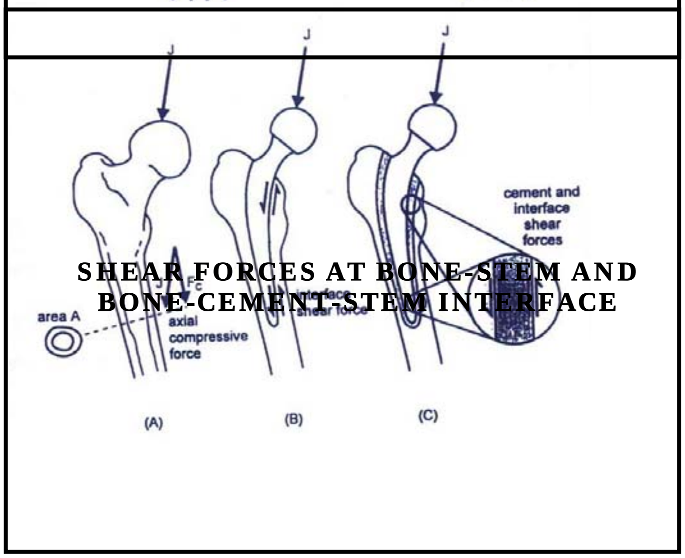
Fatigue wear

Repetitive loading produces subsurface cracks and particles, or sheets of material subsequently delaminate and are lost from the surface.

In total hip arthroplasties, abrasive and adhesive mechanisms are the most important. With the highly confirming surfaces in total hips, fatigue wear appears far less important than in total knee arthroplasties.



EXAMPLES OF MISMATCHING OF THE STEM TO THE FEMORAL CANAL



SHEAR FORCES AT BONE-STEM AND BONE-CEMENT-STEM INTERFACE

IMPLANT DESIGN

FRICTION PROPERTIES OF THE BIPOLAR

The Bipolar system functions with wear at two levels not one. This is accomplished by having a 22 mm diameter low torque bearing within a polyethylene head so that the shear stresses on acetabular cartilage are reduced.

Geometric relationship of this 2 layer system between a 22 mm internal bearing and the larger prosthetic outer head acting within the acetabulum allows the coefficient of friction of metal on polythene and metal on articular cartilage to function in tandem. It follows then that the friction of the prosthetic head within the acetabulum is greater than that required to move the 22 mm artificial bearing which is machined precisely to fit in a polythene socket.

In addition, the design of the inner bearing limits motion to a range which accommodates that required for normal activities such as: walking, climbing stairs and moving from a sitting to a standing position. Such restriction of range of motion of the inner bearing avoids the possibility of prosthetic head moving into an unfavorable varus position with the femur in neutral position.

The system is locked by a thin outer metal shell snapping on the polythene head securely locking the whole mechanism. The absence of a fixed bearing eliminates acetabular complications inherent in a fixed cup.

The implant has functioned well without mechanical flaws. It is felt that near physiological shear stress levels at the cartilage prosthetic head interface is largely achieved. The system has resulted in minimal wear at both the inner and outer bearings. The single assembly implant has provided safety and security as major factors for its increasing usefulness.

MECHANISM OF THE IMPLANT

The implant was designed to permit major motion at the inner bearing, which is geometrically perfect, so that complementary motion follows at the outer bearing triggered by even minimal irregularities of the articular cartilage. Articular cartilage then acts as a brake on outer bearing action while inner bearing motion continues uninterrupted.

It was essential to assess the implant function in a weight bearing or walking stance. The radiographic studies showed that the implant functioned as designed in all examples, but the range of respective motion between inner and outer bearing varied to a degree according to the pathological state.

In common applications then, the results were:

Fractures: 82% inner bearing & 18% outer bearing dominance.

Osteoarthritis: 95% inner bearing & 5% outer bearing dominance.

Osteonecrosis < 50 yrs: Action was almost a balanced one with 50% at inner bearing & 50% at outer bearing.

Osteonecrosis > 50 yrs: Motion was 70% at inner bearing & 30% at outer bearing.

The inner bearing motion increased significantly with weight bearing (35, 36).

EROSION OF ACETABULUM BY MIGRATION

An early prediction was that the Bipolar implant would simply act as a single unit, similar to the fixed stem Moore prostheses, and so be subject to a likelihood of acetabular penetration.

There is minimal acetabular erosion while using bipolar prosthesis when compared to unipolar system. The common denominator in protecting the acetabulum is the preservation of the subchondral layer of bone.

It is possible to contour the acetabular floor to provide an accurate seat simply by using a hand held 1 inch burr rather than the heavy total acetabular reamer. In this fashion, there are always islands of articular cartilage which survive and these have to be supported by subchondral bone, so that a scaffolding of safe control is provided.

The acetabular floor retains a regenerative property which will regenerate bone and even hypertrophic subchondral layers from the stimulation of weight bearing with an accurately fitted bipolar cup.

DISLOCATION AND INSTABILITY

It was predicted initially that the Bipolar implant would have considerable instability and probably sufficient to favor frequent dislocation. The infrequency of dislocation with the bipolar implant has made it not to be considered a potential complication. Confidence in the security of the bipolar implant has recently been highlighted by their use in salvage of failed total hips as replacement for the femoral portion, so that, in essence, there is a Tripolar property or motion at 3 levels.

WEAR PROTECTION WITH THE USE OF BIPOLAR IMPLANTS:

There are many factors favoring this hypothesis:-

1. The floating or mobile outer head has far less tendency to stick to the acetabulum to form a surface adhesion compared to the fixed acetabulum of a 2-piece arthroplasty.
2. Socket loosening cannot happen with the bipolar system, because of the controlled bearing units.

3. There is no "rock-like" facing of metal backing to favor pressure grinding-like action on the polyethylene insert. Metal backing of the acetabular cup provides a rigid wall favoring a grinding element from pressure.
4. A 2-piece as opposed to a 1-piece system always has greater polyethylene content which can be eroded.
5. Perfect congruity in 2-piece pressures is never obtained, because of the difficulty in estimating angle variation from the stem to the socket.
6. A 1-piece unit is perfectly machined, giving perfect congruity.
7. The controlled head can never be out of alignment, because its socket moves with the stem.
8. Propensity for adjustment is totally lost with 2-piece implants, once any loosening starts.
9. The Bipolar adjusts within the acetabulum to a position of stability, but even minute head motion alters stress on the acetabular floor so that trabecular fatigue does not occur.
10. In metal backed cups, there is a crushing element thrust, because the natural resiliency of the living acetabular floor is lost.
11. The acetabulum is a living layer with vitality in the subchondral bone which too frequently is excised for acetabular cup fixation. No such hazard exists with the bipolar head.
12. The single assembly is a safer system with the implant encasing a multiple bearing insert locked in place.

INDICATIONS FOR BIPOLAR ARTHROPLASTY

Traumatic

Fracture neck of femur, trochanteric fractures in elderly

Arthritis

Degenerative joint disease

- Primary
- Secondary

Rheumatoid

Juvenile Rheumatoid

Ankylosing spondylitis

Avascular necrosis

- Postfracture or dislocation
- Idiopathic

Non union, femoral neck and trochanteric fractures

Sequalae of Pyogenic arthritis

Tuberculosis

Congenital subluxation or dislocation of hip

Ankylosis conversion

Revision and Salvage

Bone tumor involving proximal femur or acetabulum

hereditary disorders

Newer Uses

Cavetary lesions

Rim and Ring defects

Contraindications

Sepsis - Any localized or distal septic focus is an absolute contraindication

Unstable medical illnesses

Neuropathic arthropathy

Progressive Neurologic disorders

Absence or insufficiency of abductor musculature

Any process that is rapidly destroying bone

Obesity - Relative contraindication

PRE OPERATIVE EVALUATION

Since bipolar hip arthroplasty is an elective surgery, a thorough preoperative evaluation must be done. The indication for the surgery must be reviewed first. The level of pain and disability, response to conservative therapy and desired life style must be considered.

The general condition of the patient including his physical and mental status, general medical condition and ability to withstand the surgery must be considered.

Physical examination should include spine and both upper and lower extremities including opposite hip, both knees and feet. Any limb length discrepancy and fixed deformities should be noted. Trendelenberg test to assess the abductor Osseo muscular mechanism should be done. Aspirin and other anti-inflammatory drugs should be discontinued 7 to 10 days prior to surgery. Pyogenic lesions should be eradicated.

PRE OPERATIVE RADIOGRAPHIC ASSESSMENT

The goal of preoperative radiographic assessment is to confirm the diagnosis leading to surgical intervention, to determine the anatomic relationship of the femur and pelvis and to allow for accurate restoration of joint anatomy and biomechanics.

For bipolar hemiarthroplasty of a routine nature, the most important x - rays are the standard pelvic roentgenogram AP view with both hips and the hip with proximal femur. Position of hips in 15 degrees of internal rotation is essential to better delineate femoral geometry and offset.

PRE- OPERATiVE PLANNING

The general goals are:

- To determine the site and size of the implants
- To restore the anatomic and bio - mechanical center of rotation of the hip joint.
- To restore any limb length discrepancy
- To restore appropriate muscle relationship.
- To anticipate any problems likely to be met such as, deficiency of part of acetabulum requiring bone grafts.

Preoperative planning should include the use of plastic overlay templates. Templating aids in selection of the type of implant that will provide the best fit implant size to restore equal limb lengths and medial offset.

Draw line at the level of and parallel to the ischial tuberosities and intersecting the lesser trochanter on each side. Compare the 2 points of intersection and measure the difference to determine the amount of shortening. Now place the acetabular template that matches the contour of acetabular subchondral bone most closely at 45 degrees of abduction. The inferomedial margin is at the level of the teardrop with full coverage of the cup. Mark the centre of the acetabular component on the radiographs. This will correspond to the new centre of rotation of the hip.

Place the femoral overlay templates on the film and select the size that most precisely matches the contour of the proximal canal and fills it most completely. If no shortening is present, then match the center of the head with the previously marked center of the acetabulum. If discrepancy exists, the distance between femoral head center and acetabulum centre should be equal to the previously measured limb length discrepancy. Mark the level of anticipated neck resection and measure the distance from the top of the lesser trochanter to use as a reference intra operatively.

SURGICAL PROCEDURE

PREPARATION OF PATIENT

On the day of the surgery, the skin is prepared using povidone iodine solution and covered with sterile clothes and brought to the theatre where the final preparation is done.

Prophylactic antibiotic is given on the table. We prefer a third generation cephalosporin in the dose of 1 gm given IV.

OPERATION THEATRE

Nowadays most hip arthroplasties are being done in theatres with laminar flow, using body exhaust systems to reduce exogenous bacterial contamination. Adequate precautions are taken to maintain asepsis such as thorough fumigation, air conditioning, limiting the flow of traffic through the theatre to essential personnel only and use of prophylactic antibiotic.

ANESTHESIA USED AND POSITIONING

Epidural or General anesthesia is usually employed. The patient is then positioned lateral.

LATERAL APPROACH (HARDINGE)

Place the patient supine with the greater trochanter at the edge of the table and the muscles of the buttocks freed from the edge. Make a posteriorly directed lazy-J incision centered over the greater trochanter. Divide the fascia lata in line with the skin incision and centered over the greater trochanter. Retract the tensor fasciae latae anteriorly and the gluteus maximus posteriorly exposing the origin of the vastus lateralis and the insertion of the gluteus medius. Incise the tendon of the gluteus medius obliquely across the greater trochanter leaving the posterior half still attached to the trochanter. Carry the incision proximally in line with the fibers of the gluteus medius at the junction of the middle and posterior thirds of the muscle. Distally, carry the incision anteriorly in line with the fibers of the vastus lateralis down to bone along the antero-lateral surface of the femur. Elevate the tendinous insertions of the anterior portions of the gluteus minimus and vastus lateralis muscles. Abduction of the thigh then exposes the anterior capsule of the hip joint. Incise the capsule as desired. During closure, repair the tendon of the gluteus medius with non-absorbable braided sutures.

POSTERIOR APPROACH (MOORE)

The patient is placed in the lateral position or semi prone on the unaffected side. The incision begins 10 cm distal to the posterior superior iliac spine, extends laterally to the greater trochanter and then distally along the lateral thigh. The fascia lata is divided over the greater trochanter and continued proximally and distally in the line of the skin incision. The fibers of gluteus maximus are separated by blunt dissection, the posterior flap containing almost the entire muscle. Retracting this posterior flap and with further blunt dissection the sciatic nerve is identifiable in the depths of the incision. Stay sutures are placed through the tendons of piriformis and obturator internus and the short external rotators are divided close to their trochanteric insertions. While retracted posteriorly they serve as a soft tissue protection for the sciatic nerve. The capsule is incised posteriorly along the femoral neck. The hip may be dislocated by flexion, adduction and internal rotation.

IMPLANTATION OF BIPOLAR PROSTHESIS:

Trim the neck of the femur appropriately and select the proper size of the prosthesis (head size and neck length). The head should fit snugly, but not rigidly. It should be loose enough to rotate in the acetabulum.

Femoral canal is prepared for the stem. Insert the reamer at a point corresponding to the piriformis fossa. The insertion point is slightly posterior and lateral on the cut surface of the femoral neck. An aberrant insertion point will not allow access to the center of the medullary canal. After the point of the reamer has been inserted, direct the handle laterally towards the greater trochanter. Aim the reamer down the femur towards the medial femoral condyle. If this cannot be accomplished, remove additional bone from the medial aspect of the greater trochanter, or varus positioning of the stem results. Use rongeur, a box chisel, or a specialized trochanteric reamer for this purpose. Generally, a groove must be made in the medial aspect of the greater trochanter to allow proper axial reaming of the canal. Insert the reamer to a predetermined point. Most reamers are marked so as to be referenced against the tip of the greater trochanter or the femoral neck cut to determine the proper depth of insertion. Proceed until firm cortical reaming is felt. Assess the stability of the axial reamer within the canal. Now proceed with preparation of the proximal portion of the femur. Remove the residual cancellous bone along the medial aspect of the neck.

If adequate stability has been obtained, make the final adjustment of the neck cut. The final level of the neck cut should be 5mm-10mm above the level of lesser trochanter.

Trial insertion of the stem is made without methyl methaacrylate. The one procedure which is essential is that the bearing insert be placed on the small bearing first and the metallic head cap afterward. Such a sequence permanently locks the system. Evaluate the center of the femoral head relative to the height of the tip of the greater trochanter.

If the neck length appears satisfactory, proceed with a trial reduction of the hip. Perform this maneuver after full muscular relaxation has been obtained. Irrigate any debris out of the acetabulum. Use a plastic covered pusher that fits over the head to push the head into the socket. Take care not to use excessive force or place excessive torsion on the femur as the hip is reduced, or femoral fracture may occur.

Now assess the stability of the joint. Move the hip through a range of motion. Note any areas of impingement between the femur and acetabulum with extremes of positioning. Proceed with cementation of the canal if required.

Insert the appropriate size prosthesis. Insert the stem to within a few centimeters of complete seating by hand. Be certain to reproduce the precise degree of ante version determined by the driving device providing with the system or a plastic tipped pusher. Use blows of equal force as the component is seated. As the component nears complete seating, it will advance in smaller increments with each blow of the mallet. An audible change in pitch usually can be detected as the stem nears final seating. Remove any debris from the acetabulum and again reduce the hip. Make sure that no soft tissues have been reduced into the joint. Confirm the stability of the arthroplasty through a full range of motion.

MATERIALS AND METHODS

This is a prospective study conducted at Department of Orthopedic Surgery, Government General Hospital, Chennai-3 during the period from July 2004 to September 2006. We had done 63 bipolar hip arthroplasty surgeries in 60 patients for varied indications.

The study included 33 males and 27 females. The age ranged from 18-85 years, average being 53.1 years.

AGE INCIDENCE:

Age Group	***No. of Patients***	***Percentage***
≤ 20	1	1.6%
21-30	5	8.3%
31-40	11	18.3%
41-50	19	31.6%
51-60	11	18.3%
>60	13	21.6%

SEX RATIO:

Sex	*No. of Patients*	*Percentage*
Male	33	55%
Female	27	45%

Thirty-five Right hips and 28 Left hips were replaced. Out of 63 hips, 41 hips were treated for fractures of femoral neck, 20 hips were treated for degenerative arthritis of various etiologies. One patient expired 1 month post operatively due to myocardial infarction and one patient was lost for follow-up

SIDE INVOLVED:

Side	***No. of Hips***	***Percentage***
Right	35	58.3%
Left	28	41.7%

Lateral approach was used for 45 cases and the remaining 18 cases were operated by posterior approach. Out of 63 hips, 42 were uncemented and 19 hips were cemented. All the patients were operated under spinal anesthesia or epidural anesthesia.

INDICATIONS FOR SURGERY:

FRACTURE GROUP

Indications	*No. of Cases*	*Percentage*
FRACTURE NECK OF FEMUR	36	85.7%
IMPLANT FAILURE	4	9.5%
PATHOLOGICAL # NOF	2	4.8%

ARTHRITIC GROUP

INDICATIONS	*NO. OF CASES*	*PERCENTAGE*
AVN FEMORAL HEAD	7	38.9%
OSTEOARTHRITIS	7	38.9%
POSTINFECTIVE SEQUELAE	2	11.1%
RHEMATOID ARTHRITIS	2	11.1%

SURGICAL APPROACHES USED:

LATERAL	45	71.4%
POSTERIOR	18	28.6%

CEMENTATION:

Implants	*No. of Hips*	*Percentage*
CEMENTED	19	30.2%
UNCEMENTED	42	69.8%

POST OP PROTOCOL:

The patients were nursed in post operative ward with the hip positioned in approximately 15 degrees of abduction using abduction pillow in the immediate post operative period.

Bed exercises and limited mobilization was started on the first post operative day. Deep breathing, quadriceps and glutei isometrics and gentle rotation exercises were begun. Drains were removed between 24 and 48 hours after surgery. Antibiotics were given parenterally for first 5 days and then orally for next 5 days. Suture removal was done between 10 and 12 days postoperatively.

In uncemented version the patients were allowed non weight bearing crutch walking for 6 weeks and after radiological assessment, protected weight bearing for approximately 12 weeks. This includes a 6 weeks on a pair of crutches or walker and another six weeks on either one crutch or one cane. The duration of protected weight bearing is dependent upon the following 3 factors:

1. Bone quality
2. Estimate of tightness of fit of implants during surgery.
3. Appearance of immediate post-operative x-rays.

Patients were instructed to use an elevated toilet seat and to use one or two ordinary pillows between the knees when lying on the non operated side and not to sit cross leg in the floor.

When cementation is done, patient is motivated to do weight bearing walking once he/she develops pain tolerance.

FOLLOW-UP:

The patients were reviewed regularly at 1 month interval for first 3 months, then at 6 months, 1 year and periodically thereafter for every 6 months. At the end of this study the patients were called back for review. Patients were reassessed clinically using the Harris hip score. X-rays of the hip were taken and were compared with the initial x-rays for signs of loosening, migration, wear and implant failure. The duration of follow up, at the end of this study ranged from 4-19 months, with an average of 11.2 months.

MODIFIED HARRIS HIP SCORE

PAIN		**DISTANCE WALKED**	
None or ignore	44	Unlimited	11
Slight, occasional	40	Six blocks	8
Mild, no effect on activities	30	Two or three blocks	5
Moderate, limitation of activities	20	Indoors only	2
Marked, serious limitation	10	Bed and chair	0
Totally crippled, bed ridden	0	**STAIRS**	
SUPPORT		Normally without using rails	4
None	11	Normally using rails	2
Cane for long walks	7	In any manner	1
Cane most of times	5	Unable to do stairs	0
One crutch	3	**PUT ON SHOES**	
Two canes	2	With ease	4
Two crutches	1	With difficulty	2
Not bale to walk	0	Unable	0
LIMP		**SITTING**	
None	11	Comfortably in ordinary chair one hour	5
Slight	8	On a high chair for one half hour	3

Moderate	5	Unable to sit comfortably in any	0
Severe	0		

MODIFIED HARRIS HIP SCORE

Enter public transport (1) : YES/NO

Flexion contracture : --------- degrees

Leg length discrepancy : ---------- cms

ABSENCE OF DEFORMITY (All YES = 4; Less than 4 = 0)

Less than3o degrees of FFD YES/NO

Less than 10 degrees of fixed adduction YES/NO

Less than 10 degrees fixed IR deformity YES/NO

Limb length discrepancy < 3.2 cm YES/NO

RANGE OF MOTION

Flexion (140) External rotation (40)

Abduction (40) Internal rotation (40)

Adduction (40)

RANGE OF MOTION SCALE

211-300 (5) 61-100 (2)

161-210 (4) 31-60 (1)

101-160 (3) 0-30 (0)

RANGE OF MOTION SCORE : --------

TOTAL HARRIS HIP SCORE : ---------

Readmission to hospital: YES/NO

Comments:

Date: Investigator signature

OBSERVATION

The following observations were made in this prospective study conducted at Department of Orthopedic Surgery, Government General Hospital, Chennai-3 during the period from June 2004 to September 2006.

1. This study had a male predominance (55%) and 68% of the patients were between 30 and 60 years of age.

2. Right hips were operated more frequently (58%) than the left (42%).

3. Lateral Hardinge approach was followed in 71% of cases. The familiarity and surgeon's experience were the factors for following the approach.

4. Fractures of femoral neck were the most common indication in the fracture group and osteonecrosis of femoral head and osteoarthritis in the arthritic group.

5. Uncemented arthroplasty was predominant (63% in fracture group and 65% in the arthritic group).

6. The duration of hospital stay varied between 35 and 45 days. The prolonged stay was due to the patient awaiting his/her turn for surgery. The average post operative stay was 5.6 days. The standard

post operative protocol was followed.

7. The follow-up in our study ranged 4-19 months with an average of 10.7 months.

8. Analyzing the results, it was observed that 90% of the cases in fracture group had good to excellent results and 65% in arthritic group had the same.

9. Ninety percent of the uncemented hips had good to excellent results when compared to 73% in cemented version. This is probably because of higher number of hips (96% in fracture group and 81% in arthritic group) were replaced without cementation.

10. The discrepancy in limb length seen in 10 cases (16%) was the most predominant complication. The prosthesis is used for the first time in this institution and the above complication could be avoided in future once the surgeon's familiarity with the prosthesis and surgical techniques improves.

11. The other most troubling complication of anterior thigh pain noted was due to femoral component loosening seen in 9 hips replaced (14%), all of them being uncemented. Cementation would probably improve the results in this group.

RESULTS

In this study, we have analyzed the functional results of the bipolar hemiarthroplasty, done in 63 hips of 60 patients, in Government General Hospital, Chennai during the period June 2004 to September 2006.

All patients were evaluated clinically and radiologically preoperatively and at various follow up periods. All the patients were analyzed using Modified Harris Hip Score.

Based on the Harris Hip Score (HHS), the results were divided into excellent, good, fair and poor as below:

Excellent	:	$\geq$ 90 points
Good	:	80-89 points
Fair	:	70-79 points
Poor	:	<70 points

Our study was divided into two groups:

1. Fracture group
2. Arthritic group

In fracture group consisting of 41hips, 90% were rated to have good to excellent results (58.5% excellent and 31.7% good), 10% were rated to have poor results.

FRACTURE GROUP:

Results	***Uncemented***	***Cemented***
Excellent	13 (31.7%)	11(26.8%)
Good	12(29.3%)	1(2.4%)
Fair	-	-
Poor	1(2.4%)	3(7.3%)

In arthritic group consisting of 20 hips, 65% showed good to excellent result (30% excellent, 35% good), 15% rated to be poor and 10% fair.

ARTHRITIC GROUP:

Results	***Uncemented***	***Cemented***
Excellent	**6(30%)**	**-**
Good	**7(35%)**	**2(10%)**
Fair	**-**	**2(10%)**
Poor	**3(15%)**	**-**

Cemented hips showed 73% good to excellent results (58% excellent and 15%good). 90% were rated good to excellent (45% excellent and good each) in uncemented variety.

CEMENTED VS UNCEMENTED HIPS:

Results	Uncemented	Cemented
Excellent	19 (45.2%)	**11 (57.9%)**
Good	19(45.2%)	**3 (15.8%)**
Fair	-	**2 (10.5%)**
Poor	**4 (9.6%)**	**3 (15.8%)**

1. Including both groups, 19 hips had excellent and good results each and 4 had poor results in the uncemented variety.

2. Whereas in the cemented version, 11 had excellent results, 3 had good results, 2 had fair and 3 had poor results.

All the patients were analyzed radiologically also during various follow up periods. The prosthesis was assessed for its position, loosening, migration or implant failure.

COMPLICATIONS:

In our study, the following complications were noted:

LIMB LENGTH DISCREPANCY:

Ten (16%) patients had limb length discrepancy. It ranged from 1cm to 3.5 cm for which heel and sole raise footwear was prescribed. These patients had moderate limp.

FEMORAL STEM LOOSENING:

The most troubling complication was the anterior thigh pain due to the femoral stem loosening. It occurred in nine (14%) of hips in uncemented variety. Pain was not impairing the functional outcome of the patients. None was revised with cementation.

DEEP INFECTION:

Two (3%) of the cases had infection. One died of septicemia. Two required implant removal.

MALPOSITION OF IMPLANT:

It occurred in one patient. The implant was inserted in excessive ante version. Revision Bipolar arthroplasty was done with cementation.

INTRAOPERATIVE TROCHANTENIC AND PROXIMAL FEMORAL FRACTURES:

It occurred in two cases (3%). Per-operatively, the hip was not reducible and during manipulation, greater trochanter splintered. Circlage wiring was done and the patient was allowed full weight-bearing after union of fracture.

CASE – 1

NAME	:	Mrs.DHANALAKSHMI
AGE	:	42/F
IP. NO.	:	697619
DIAGNOSIS	:	Rheumatoid arthritis both hips
TREAMENT	:	R Uncemented bipolar arthroplasty
PRE OP SCORE	:	26
FOLLOW-UP	:	19 months
POST OP SCORE	:	81
RESULT	:	GOOD

CASE – 2

NAME	:	Mr.RAMAKRISHNAN
AGE	:	45/M
IP. NO.	:	702329
DIAGNOSIS	:	# NECK OF FEMUR LEFT
TREAMENT	:	L Uncemented bipolar arthroplasty
FOLLOW-UP	:	19 months
POST OP SCORE	:	88
RESULT	:	GOOD

CASE – 3

NAME	:	Mr.MANIMARAN
AGE	:	32/M
IP. NO.	:	749948
DIAGNOSIS	:	POST INFECTIVE SEQUAELAE ® HIP
TREAMENT	:	R Uncemented bipolar arthroplasty
FOLLOW-UP	:	11 months
PRE OP SCORE	:	28
POST OP SCORE	:	93
RESULT	:	EXCELLENT

CASE – 4

NAME	:	Mr.MOORTHY
AGE	:	35/M
IP. NO.	:	755541
DIAGNOSIS	:	® # NECK OF FEMUR
TREAMENT	:	R Uncemented bipolar arthroplasty
FOLLOW-UP	:	10 months
POST OP SCORE	:	96
RESULT	:	EXCELLENT

CASE – 5

NAME	:	Mr.KAVERI
AGE	:	55/F
IP. NO.	:	722240
DIAGNOSIS	:	L # NECK OF FEMUR
TREAMENT	:	L Cemented bipolar arthroplasty
FOLLOW-UP	:	16
POST OP SCORE	:	97
RESULT	:	EXCELLENT

DISCUSSION

The present study was designed to examine the functional results of bipolar hip replacement in fracture of femoral neck and degenerative arthritis. Overall 85% were rated good to excellent (49% excellent and 36% good) and 11.4% were poor. These results are similar to those studies reported earlier.

For more convenience, this study is discussed in two parts. The fracture group and the arthritic group are compared with similar study.

FRACTURE GROUP:

Nile R. Lestrange[18] from the Department of orthopedic surgery, North Ridge Medical Center, Ft. Lauderdale, Florida prospectively analyzed 496 cases of hip fractures treated with bipolar arthroplasty from 1974 to 1988.

Since the materials and methods used for the analysis were similar to our study, this study was chosen for the comparison of results of our study.

Harris Hip score system includes all the essential criteria with adequate weightage for functional assessment. It is widely accepted as a good scoring system and we have also used this in our study.

In the series by Lestrange[18] et al, the average age was 79.7 years with a range of 53 to 97 years. The average age in our study was 53.1 years (range, 18 to 85). The mean follow-up in our study was 10.7 months compared to 2.73 years in the study by Lestrange[18] et al.

Lestrange[18] et al study included 496 cases of hip fractures of which 397 were women and 88 men, whereas there was a male predominance in our study. Of the above cases, 65% were of femoral neck fracture and the remaining 35% being trochanteric fractures. In our study, the most common indication for surgery was factures of femoral neck (85 %).

Lestrange[18] et al followed 72% of the patients post operatively whereas 97% of patients were followed post operatively by us.

CRITERIA	***LESTRANGE[18] ET AL***	***OUR STUDY***
Average age	79.7 years	53.1 years
Mean follow-up	2.73 years	10.7 months
Indication	#s of femoral neck	#s of femoral neck
Good to excellent results	70.8%	90.2%
Mean hip score	80	87.7

Poor results	27.2%	10.1%

The results were rated good to excellent in 70.8% (39.6%-excellent and 31.2%-good) by Lestrange[18] et al with the mean postoperative Harris hip score of 80. In our study, the results were good to excellent in 90.2% (58.5%-excellent and 31.7%-good) with the mean post operative Harris hip score of 87.7.

The poor results in Lestrange[18] et al study (27.2% fair to poor) were due to dislocations, loosening of implants and infection. The poor results in our study (10.1% fair to poor) are due to removal of implant due to limb length discrepancy, loosening and uncontrolled infection.

ARTHRITIC GROUP:

Arthur J.Bowman[3] et al from Carney Hospital, Boston, Massachussets, and South Shore Hospital, South Weymouth, Massachusettts retrospectively studied the functional outcome of bipolar arthroplasty in 100 consecutive patients of degenerative arthritis between August 1974 and August 1986.

This study has been chosen for comparison with our study.

The mean age at the time of surgery was 69 years (range, 48-90) in the series by Bowmann et al[3]. The average age was 46.6 years in our study (range, 18 to 67). The patients were followed up for 10.7 months on an average in our study compared to 24 months in the above study.

CRITERIA	**BOWMANN ET AL[3]**	***OUR STUDY***
Average age	69 years	46.6 years
Mean follow-up	24 months	10.7 months
Indication	Osteoarthritis	AVN, OA
Good to excellent results	75.8%	75%
Mean hip score	78.8	82.1
Poor results	32.8%	25%

The prime indication (65 hips) for surgery was primary OA as noted by Bowmann et al[3]. In our study, the common indications were osteonecrosis and OA in equal number of hips (7).

Bowmann et al[3] rated 75.8% of the operated hips to be good to excellent (22.9% excellent, 52.9% good) with a mean hip score of 78.8. In our study we found 75% of hips to be good to excellent (30% excellent, 45%good) with a mean hip score of 82.1. Anterior thigh pain was the cause of poor results in both and none of the prosthesis dislocated in both studies.

CEMENTATION:

In Bowmann et al[3] series, all replacements were done without cementation and 32.8% fair to poor results were observed. The reason for this high rate of failure was loosening of the femoral stem. They showed that revision of 6 hips with cementation improved the rating from good to excellent. Similar results were reported in Whittaker et al[40] study in which 42% had significant pain in theirs hips related to loosening of the stem. Later, with cementation results improved from good to excellent.

Ninety percent of hips had good to excellent results in uncemented version of our study and 73.1% in cemented hips, contrary to other studies. The majority of hips were replaced without cementation in our study. The prosthesis used in our study was not of snug press fit type and hence loosening was seen in 9 cases, all of them being uncemented. None of the cemented hips had similar complaints during entire follow-up. Hence cementation has advantage of good stability and functional out come when compared to the uncemented hips in osteoporosis and hips with wide medullary canal.

FACTORS FOR SUCCESS IN BIPOLAR ARTHROPLASTY

The patients treated comprise a different group from those presenting with fractures of the neck of the femur to osteoarthrosis of the hip.

1) The patient's expectations of the result of the operation must be realistic: In particular, patients should be explained of the possibility of thigh pain which may persist for up to a year after the operation, particularly if an uncemented stem has been used.

2) At operation it is important to ensure that the metal shell of the bipolar prosthesis moves freely within the acetabulum. For this reason, if there is any doubt as to the size of the head to be used, one should select a smaller rather than a larger one.

3) With regard to the selection of the type and size of prosthetic stem to be used, select a stem which achieves the most complete "fill" of the medullary cavity of the femur.

Bipolar hip arthroplasty is a viable alternative to total hip arthroplasty in fractures of femoral neck and degenerative arthritis of the hip. Technical ease, as well as the omission of most acetabular complications, makes this procedure appealing. Acetabular involvement in the disease process of osteoarthritis is not a contraindication.

With judicious use of cement and refinement of prosthetic design, the results should rival those of conventional total hip arthroplasty.

CONCLUSION

The Single assembly, Low Friction Bipolar arthroplasty is one of the best choices of surgery for fracture neck of femur in elderly[9, 11, 16, 17 and 23] and for hip diseases in younger individuals, both primary[1, 3, 42 and 49] and revision[23].

Its extended indications for failed replacements, acetabular deficiencies[6, 7] and tumors of hip indicate the varied uses of the endoprosthesis.

The use of cemented version in elderly[3] has good functional results and better primary stability. The uncemented version in younger individuals should be done with a snug press-fit type of prosthesis[3 and 43], lest loosening occurs. The press fit model with fenestration provides for bone ingrowths and superior bond strength[3 and 43] at the implant interface. The bond strength and high coefficient of friction assure rigid, mechanical stability which is an essential factor for bone ingrowths.

Usefulness has progressed from simple fractures to all forms of hip reconstruction[23, 31, 35 and 41]. The implant has stood the test of time since it was introduced. The implant has functioned as designed with a multiple layer action[4].

Its application has been characterized by a minimal number of complications and progressive broadening of its usefulness.

As this is only a short term study, further follow-up and evaluation is essential to come out with a definitive conclusion.

BIBLIOGRAPHY

1. Bateman JE, Berenji AR, Bayne O, Greyson ND. Long-term results of bipolar arthroplasty in osteoarthritis of the hip. Clin Orthop. 251: 54-66, 1990.
2. Bourne RB. The problem of wear following total hip arthroplasty. Primary and revision arthroplasty of the hip symposium. Aug/Sept. 1995. Toronto, Canada.
3. Bowman AJ, McConville OR, Kilfoyle RM, McConville JF, Mayo RA. Bipolar hemiarthroplasty in degenerative arthritis of the hip: 100 consecutive cases. Clin Orthop. 251: 67-74, 1990.
4. Burton P, Prieskorn D, Smith R, Page BJ 2nd, Swienckowski J. Component motion in bipolar hip arthroplasty: an evaluation of reamed and non-reamed acetabula. Orthopedics. 17(4): 319-324, 1994.
5. Cabanela ME. Bipolar versus total hip arthroplasty for avascular necrosis of the femoral head. A comparison. Clin Orthop. 261: 59-62. 1990.
6. Cameron HU, Jung YB. Acetabular revision with a bipolar prosthesis. Clin Orthop. 251: 100-103. 1990.
7. Chang JK, Wu HS, Hsu JC, Yei SM, Lin SY. Reconstruction of the severely deficient acetabulum with the bipolar prosthesis

and allo-autograft. Kao Hsiung I Hsueh Ko Hsueh Tsa Chih. 8(2): 82-88. Feb. 1992.

8. D'Antonio JA, Capello WN, Jaffe WL. Hydroxylapatite-coated hip implants. Multicenter three-year clinical and roentgenographic results. Clin Orthop. 285: 102-115. 1992.

9. Gallinaro P, Tabasso G, Negretto R. Brach Del Prever EM. Experience with bipolar prosthesis in femoral neck fractures in the elderly and debilitated. Clin Orthop. 251: 26-30. 1990.

10. Garrahan WF, Madden EJ. The long-stem bipolar prothesis in surgery of the hip. Clin Orthop. 251: 31-37. 1990.

11. Goldhill VB, Lyden JP, Cornell CN, Bochner RM. Bipolar hemiarthroplasty for fracture of the femoral neck. J Orthop Trauma. 5(3): 318-324. 1991.

12. Grigoris P, Grecula MJ, Amstutz HC. Tripolar hip replacement for recurrent prosthetic dislocation. Clin Orthop. 304: 148-155. 1994.

13. Gross AE. Use of banked bone in revision hip surgery. Classifications of bone defects. Transactions. Primary and revision arthroplasty of the hip symposium. Aug/Sept. 1995. Toronto, Canada.

14. Haentjens P, de Neve W, Casteleyn PP, Opdecam P. Massive resection and prosthetic replacement for the treatment of metastases of the trochanteric and sub-trochanteric femoral

region. Bipolar arthroplasty versus total hip arthroplasty. Acta Orthop Belg. 59: Suppl 1.367-371, 1993

15. Haentjens P, Casteleyn PP, Opdecam P. Primary bipolar arthroplasty or total hip arthroplasty for the treatment of unstable intertrochanteric and subtrochanteric fractures in elderly patients. Acta Orthop Belg. 60: Suppl 1.124-128, 1994.

16. Harwin SF, Stern RE, Kulick RG. Primary Bateman-Leinbach bipolar prosthetic replacement of the hip in the treatment of unstable intertrochanteric fractures in the elderly. Orthopedics. 13(10): 1131-1136. 1990.

17. LaBelle LW, Colwill JC, Swanson AB. Bateman bipolar hip arthroplasty for femoral neck fractures. A five-to ten year follow-up study. Clin Orthop. 251: 20-25. 1990.

18. Lestrange NR. Bipolar arthroplasty for 496 hip fractures Clin Orthop. 251: 7-19. 1990.

19. Matsuda Y, Yamamuro T. Metallosis due to abnormal abrasion of the femoral head in bipolar hip prosthesis. Implant retrival and analysis in six cases. Med Prog Technol. 20(3-4): 185-189. 1994.

20. Mess D, Barmada R. Clinical and motion studies of the Bateman bipolar prosthesis in osteonecrosis of the hip. Clin Orthop. 251: 44-47. 1990.

21. Middha VP, Singhal K. Radiographic assessment of cup

migration in bipolar hip arthroplasty: intra-observer and inter-observer errors and tolerance limits. Arch Orthop Trauma Surg. 111: (4) 230-231. 1992.

22. Moshien J, Alter AH, Elconin KB, Adams WW, Isaacson J. Transcervical fractures of the hip treated with the Bateman bipolar prosthesis. Clin Orthop. 251: 48-53. 1990.

23. Murray WR. Acetabular salvage in revision total hip arthroplasty using the bipolar prosthesis. Clin Orthop. 259: 212-219. 1990.

24. Murzic WJ, McCollum DE. Hip arthroplasty for osteonecrosis after renal transplantation. Clip Orthop. 299: 212-219. 1994.

25. Nakata K, Ohzono K Hiroshima K. Progressive migration in bipolar arthroplasty for osteoarthritis of the hip secondary to congenital dislocation. Clin Orthop. 304: 156-164. 1994.

26. Nottage WM, McMaster WC. Comparison of bipolar implants with fixed-neck protheses in femoral-neck fractures. Clin Orthop. 251: 38-43. 1990.

27. Ochsner JL Jr, Penenberg BL, Dorr LD, Conaty JP. The bipolar endoprosthesis and bone graft in the management of aseptic acetabular component loosening. Orthopedics. 13: (1) 45-49. 1990.

28. Phillips TW, Rao DR. Bateman bipolar hips with autologous bone graft reinforcement for dysplastic acetabular. Clin

Orthop. 251: 104-112. 1990

29. Rao JP, Bronstein R. Dislocations following arthroplasties of the hip. Incidence, prevention and treatment. Orthop Rev. 20: (3) 261-264. 1991.

30. Ries MD, Wiedel JD. Bipolar hip arthroplasty for recurrent dislocation after total hip arthroplasty. A report of three cases. Clin Orthop. 278: 121-127. 1992.

31. Roberson JR, Cohen D. Bipolar components for severe periacetabular bone loss around the failed total hip arthroplasty. Clin Orthop. 251: 113-118. 1990.

32. Rorabeck CH. Total hip replacements in CDH. New developments in total joint reconstruction. Joint Implant Research Foundation Symposium. San Diego, CD., 1995.

33. Schaffer JL, Wilson MG, Scott RD. Capsular impingement as a source of pain following bipolar hip arthroplasty. J. Arthroplasty. 6: 163-168. 1991.

34. Takaoka K, Nishina T, Ohzono K, Saito M, Matsui M, Sugano N, Saito S, Kadowaki T, Ono K. Bipolar prosthetic replacement for the treatment of avascular necrosis of the femoral head. Clin Orthop. 277: 121-127. 1992.

35. Torisu T, Utsunomiya K, Maekawa M, Ueda Y. Use of bipolar hip arthroplasty in states of acetabular deficiency. Clin Orthop. 251: 119-125. 1990.

36. Torisu T, Izumi H, Fujikawa Y,Matsui S. Bipolar hip arthroplasty without acetabular bone-grafting for dysplastic osteoarthritis. Results after 6-9 years J. Arthroplasty. 10: (1) 15-27. 1995.

37. Van Raay JJ, Willems WJ, Rozing PM. The uncemented Gerard bipolar double-cup arthroplasty of the hip. A five-to eleven-year follow-up study. Clin Orthop. 294: 123-130. 1993.

38. Vazquez-Vela E, Vazquez-Vela G. Acetabular reaction to the Bateman bipolar prosthesis. Clin Orthop. 251: 87-91. 1990.

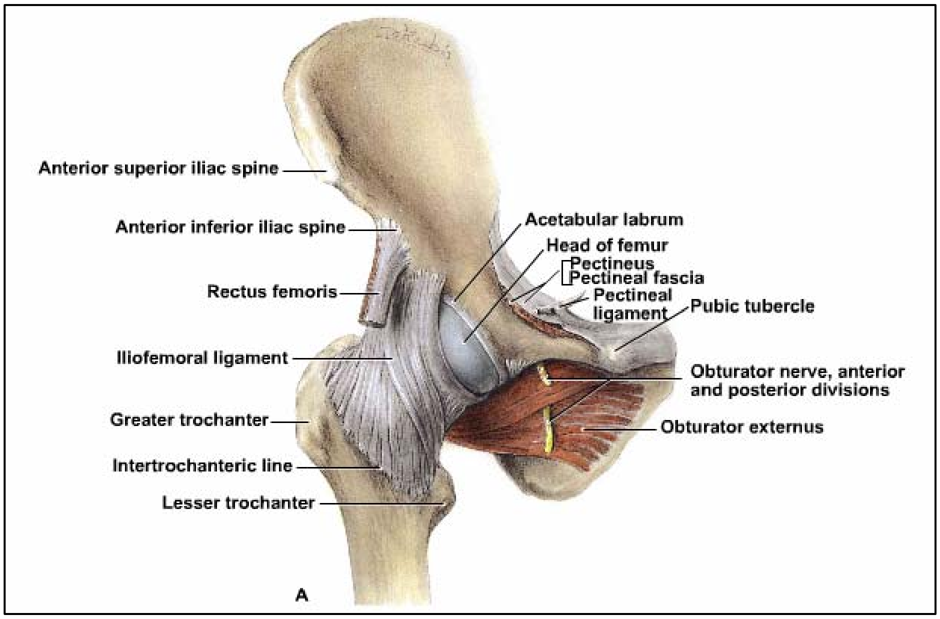
39. Vazquez-Vela G, Vazquez-Vela E, Dobarganes FG. The Bateman bipolar prosthesis in osteoarthritis and rheumatoid arthritis: A review of 400 cases. Clin Orthop. 251: 82-86. 1990.

40. Whiteside L. Strut allografting and cabling. New developments in total joint reconstruction. Joint Implant Research Foundation Symposium. San Diego, CA. Aug. 1995.

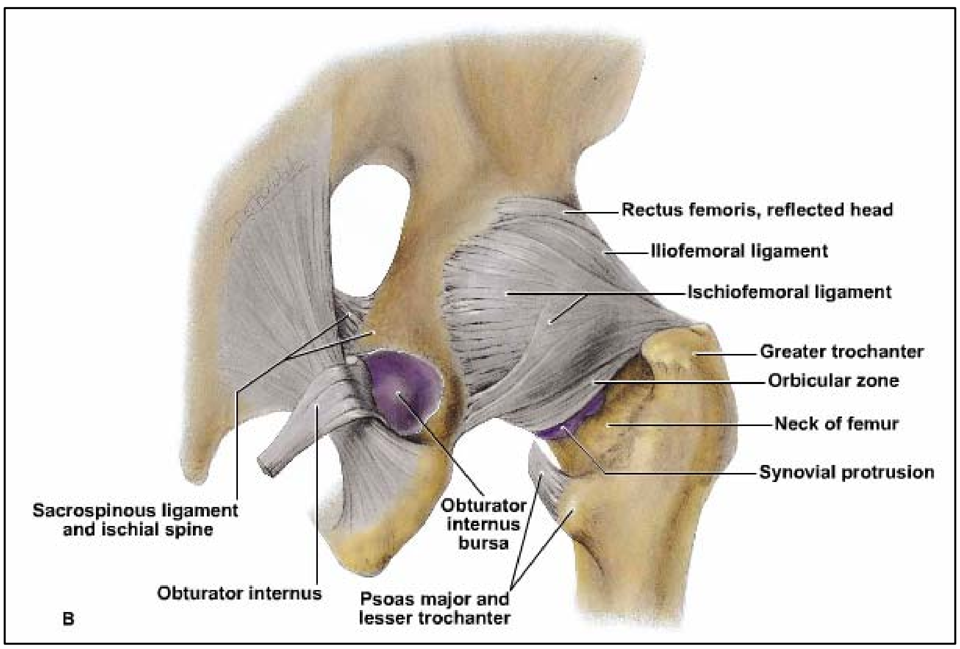
41. Wilson MG, Scott RD. Reconstruction of the deficient acetabulum using the bipolar socket. Clin Orthop. 251: 126-133. 1990.

42. Yamamuro T, Ueo T, Okumura H, Iida H, Hamamoto T Five-year results of bipolar arthroplasty with bone graft and reamed acetabulum for osteoarthritis in young adults. Clin Orthop. 251: 75-81. 1990.

HIP JOINT - ANATOMY

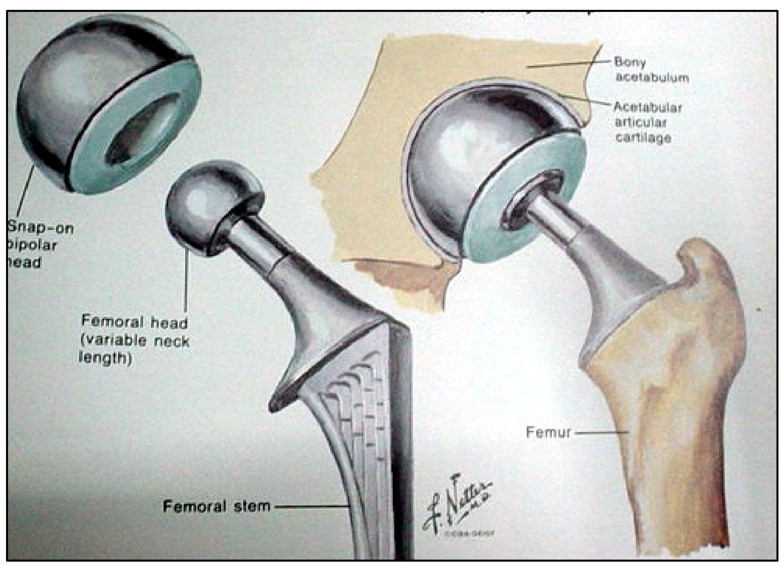


ANTERIOR ASPECT



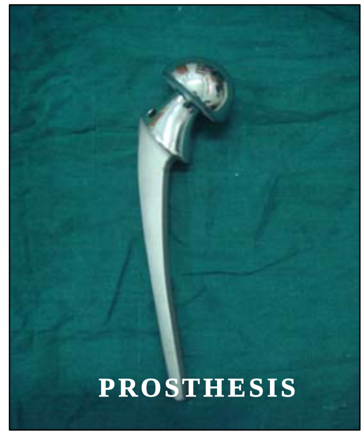
POSTERIOR ASPECT

IMPLANT DESIGN



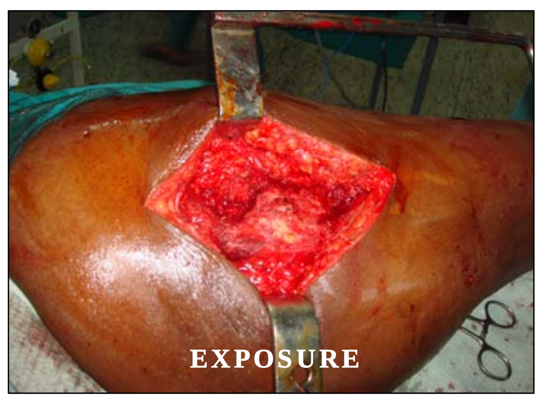
SURGICAL PROCEDURE

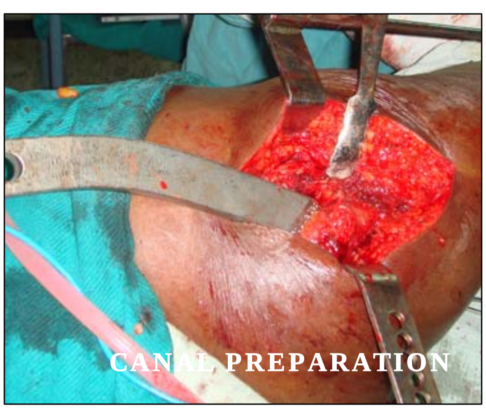

INSTRUMENTS


PROSTHESIS


LATERAL POSITION

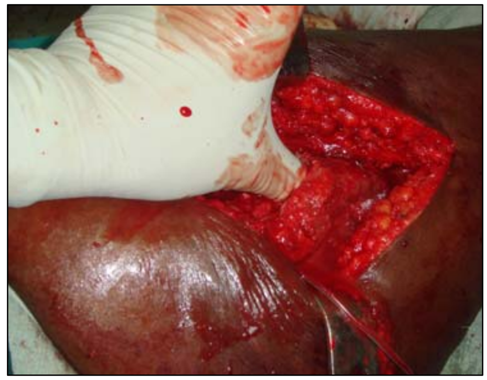

INCISION


EXPOSURE


CANAL PREPARATION


AFTER REAMING

SURGICAL PROCEDURE

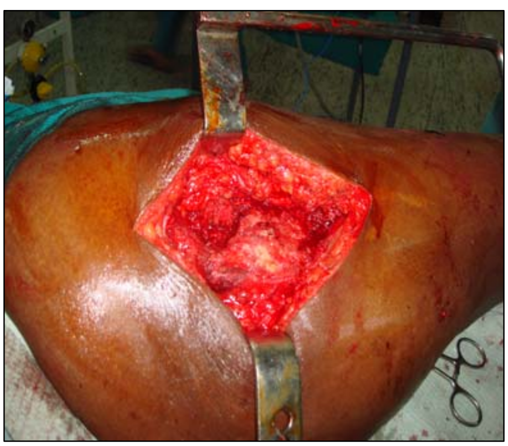


CEMENT PREPAPATION

CEMENT PACKING

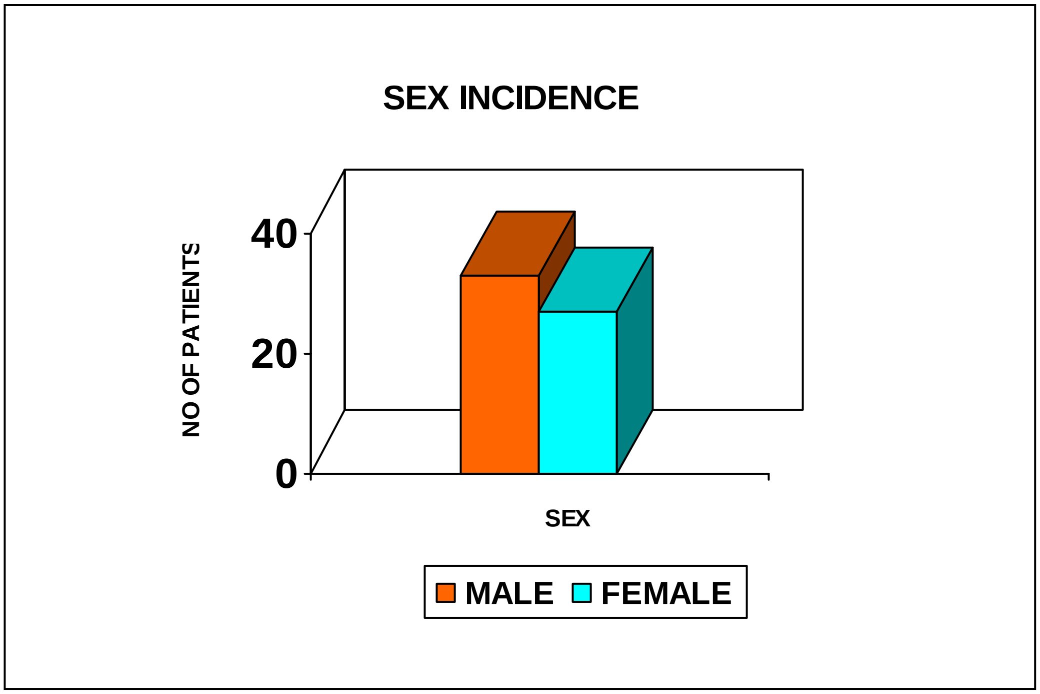
INSERTION OF PROSTHESIS

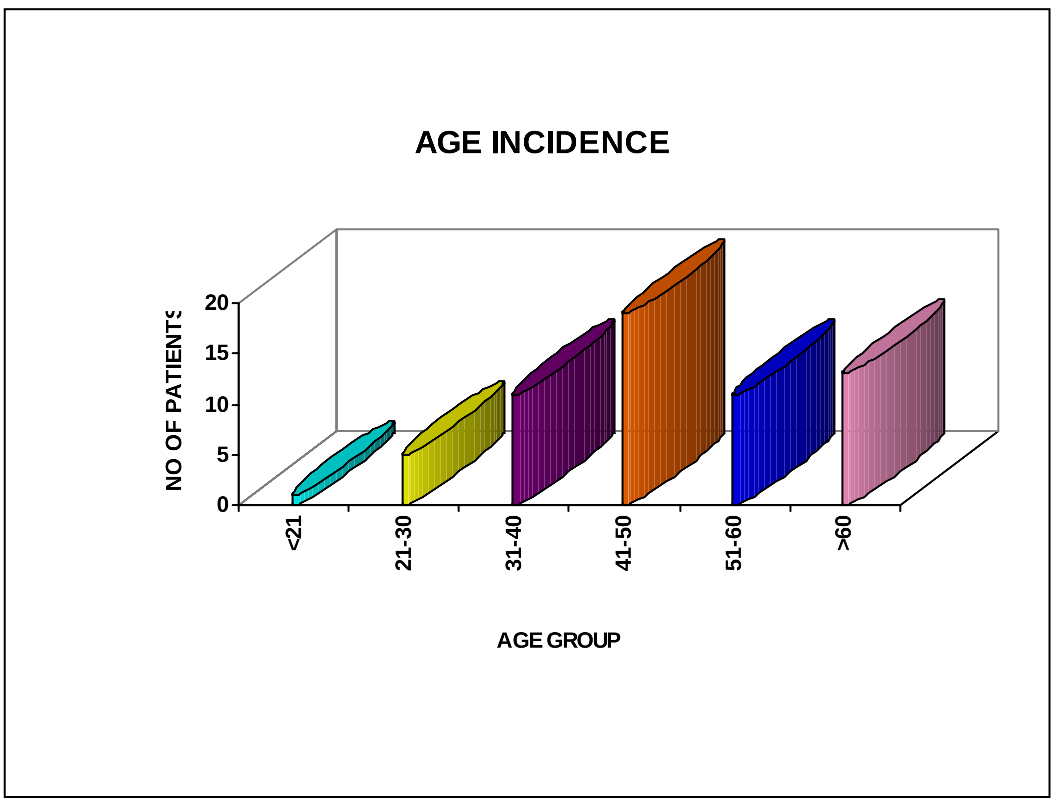
AFTER SETTING

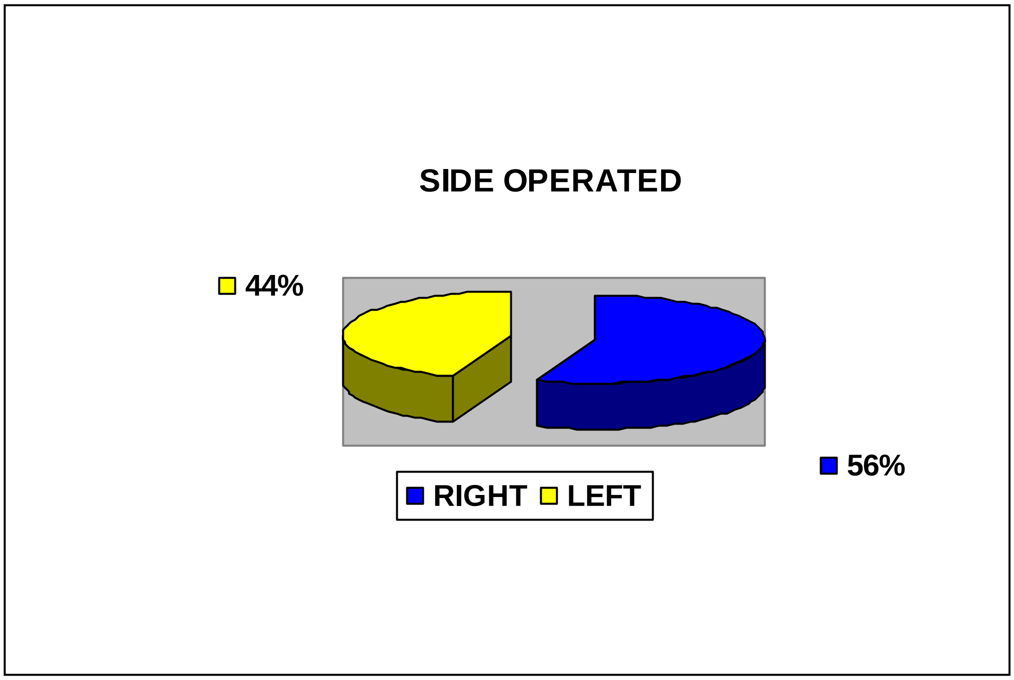


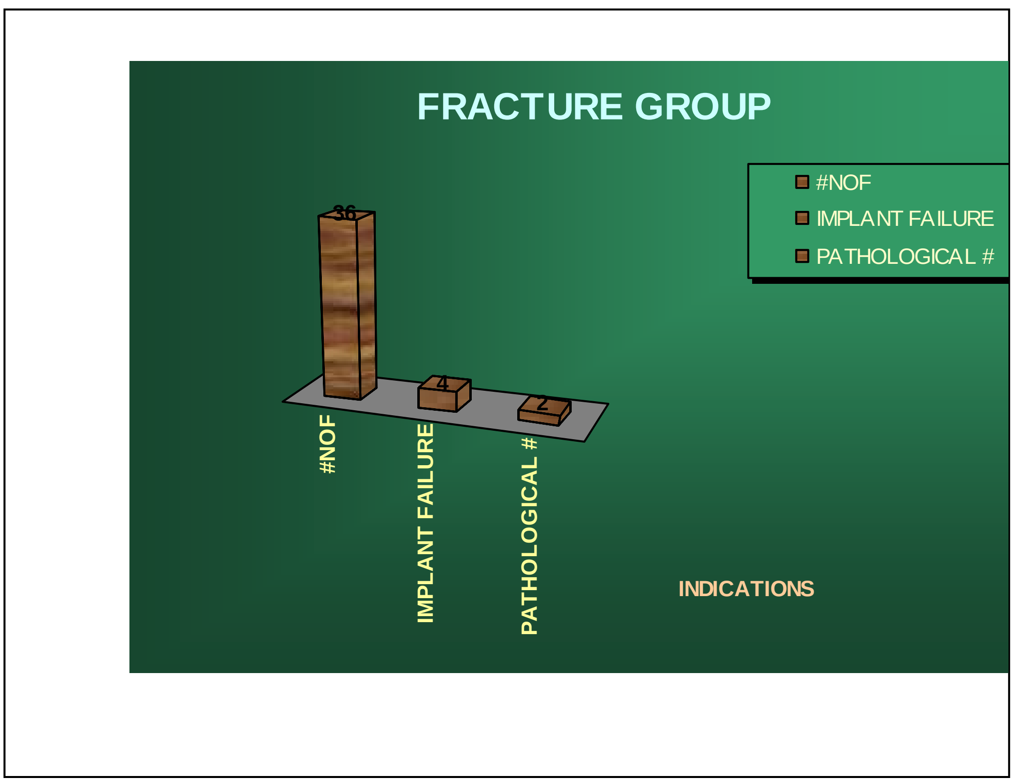
AFTER REDUCTION

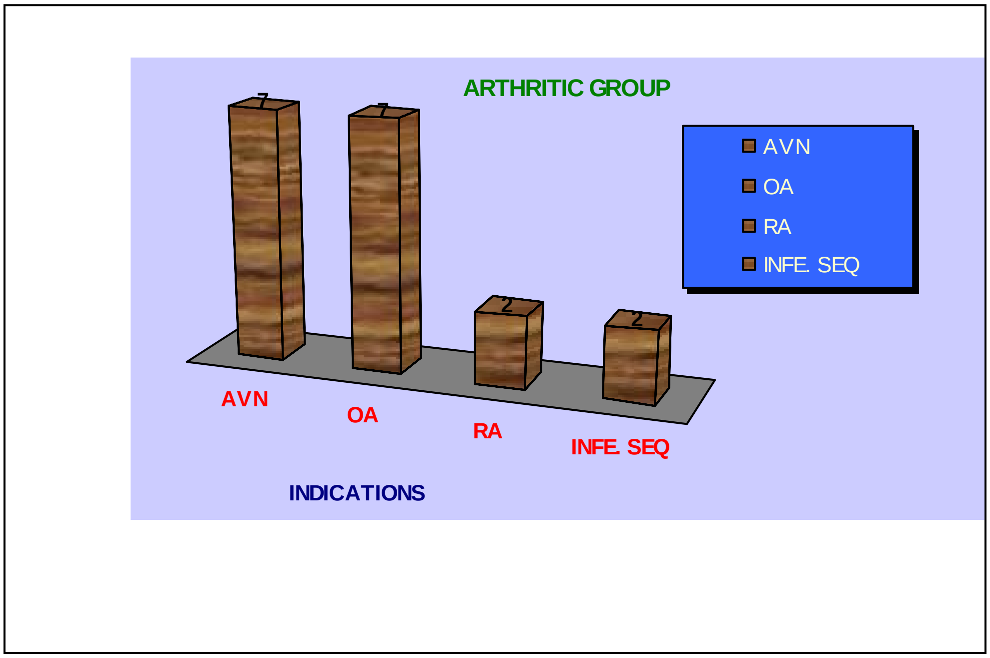
CLOSURE

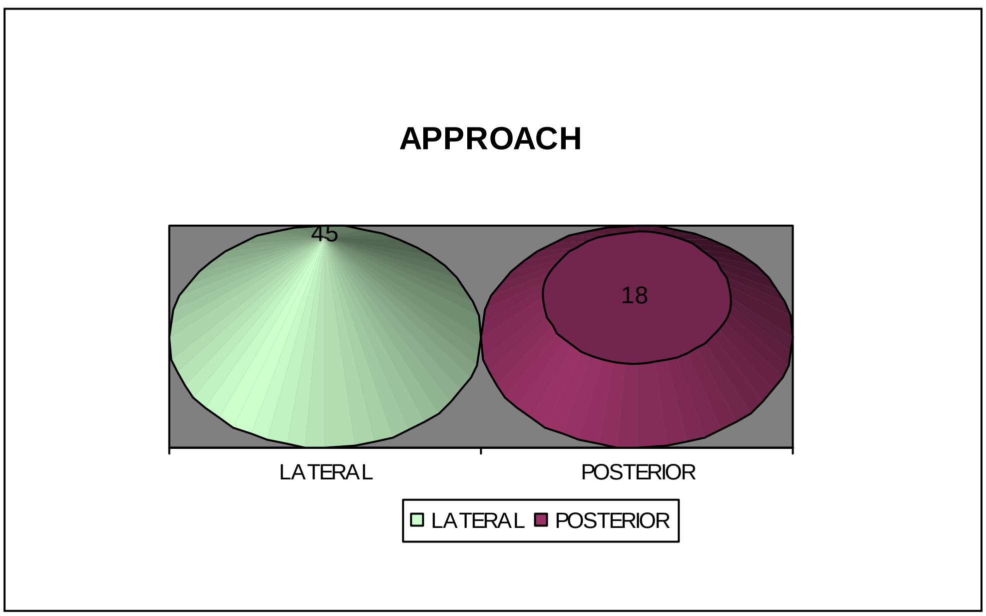

SEX INCIDENCE
40
20
0
NO OF PATIENTS
SEX
MALE
FEMALE

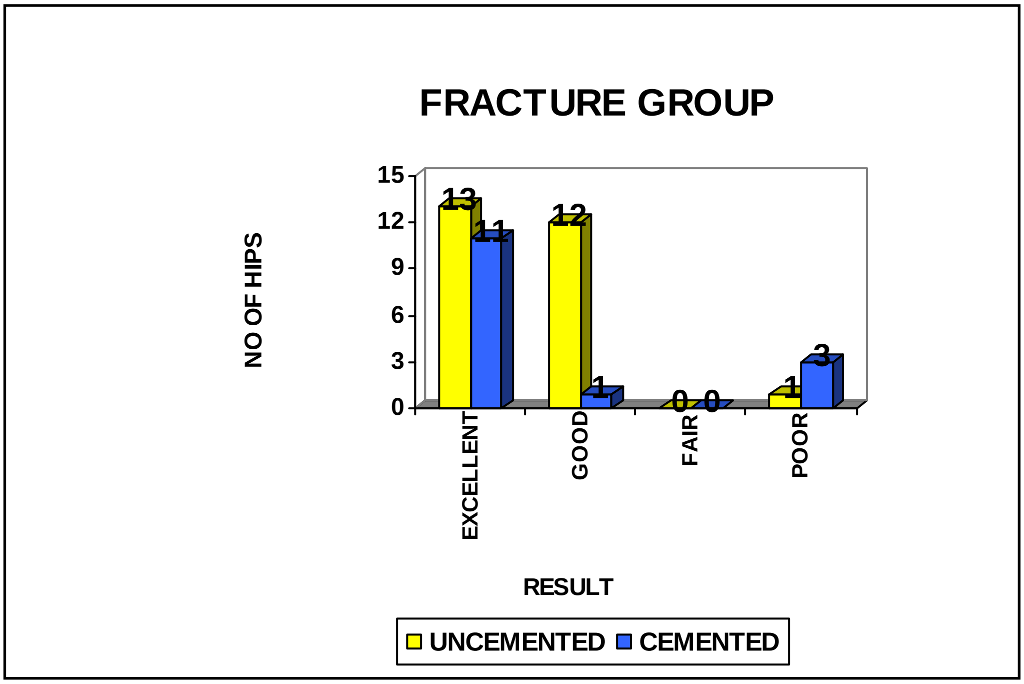

AGE INCIDENCE
20
15
10
5
0
NO OF PATIENTS
<21
21-30
31-40
41-50
51-60
>60
AGE GROUP

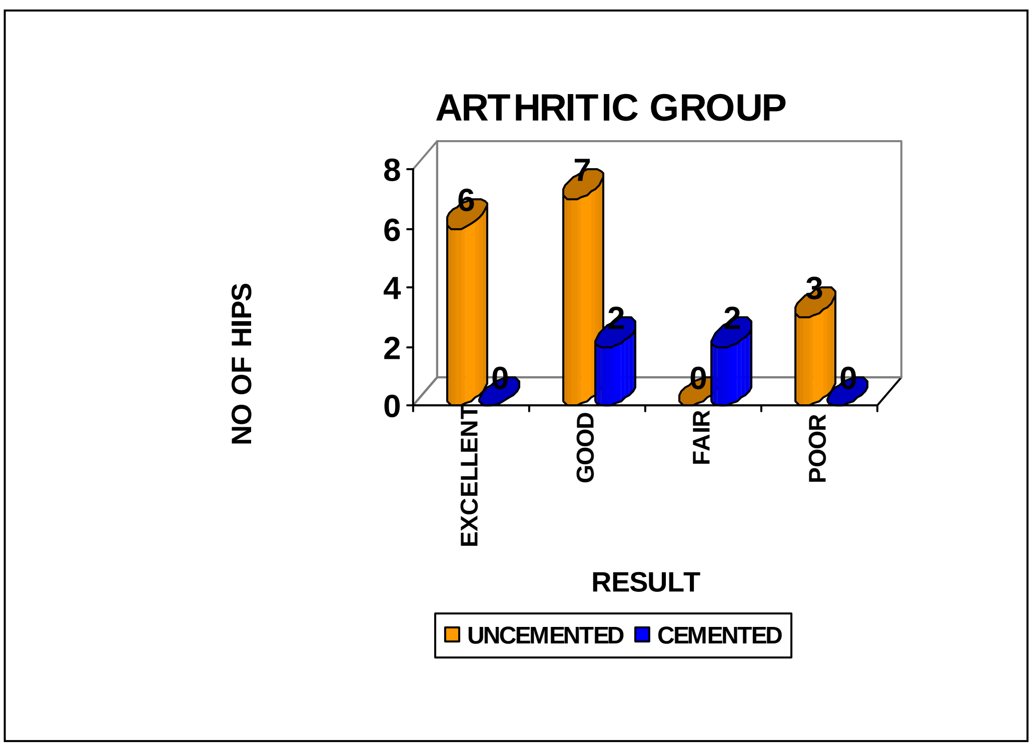

SIDE OPERATED
44%
56%
RIGHT
LEFT

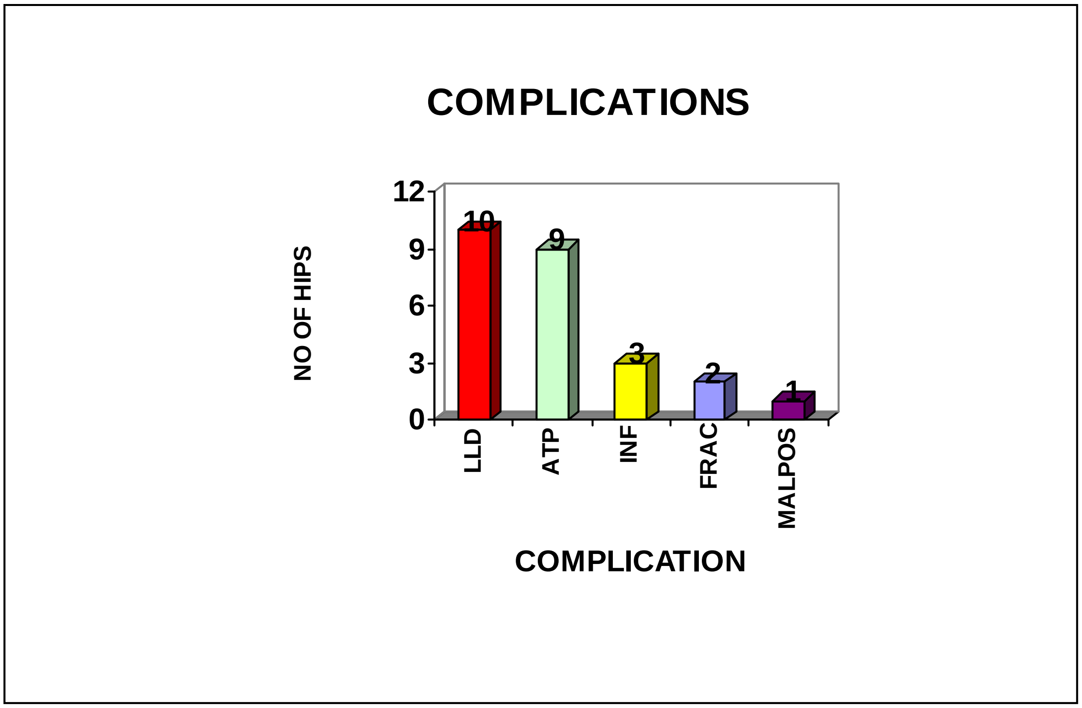

FRACTURE GROUP
#NOF
IMPLANT FAILURE
PATHOLOGICAL #
36
4
2
#NOF
IMPLANT FAILURE
PATHOLOGICAL #
INDICATIONS

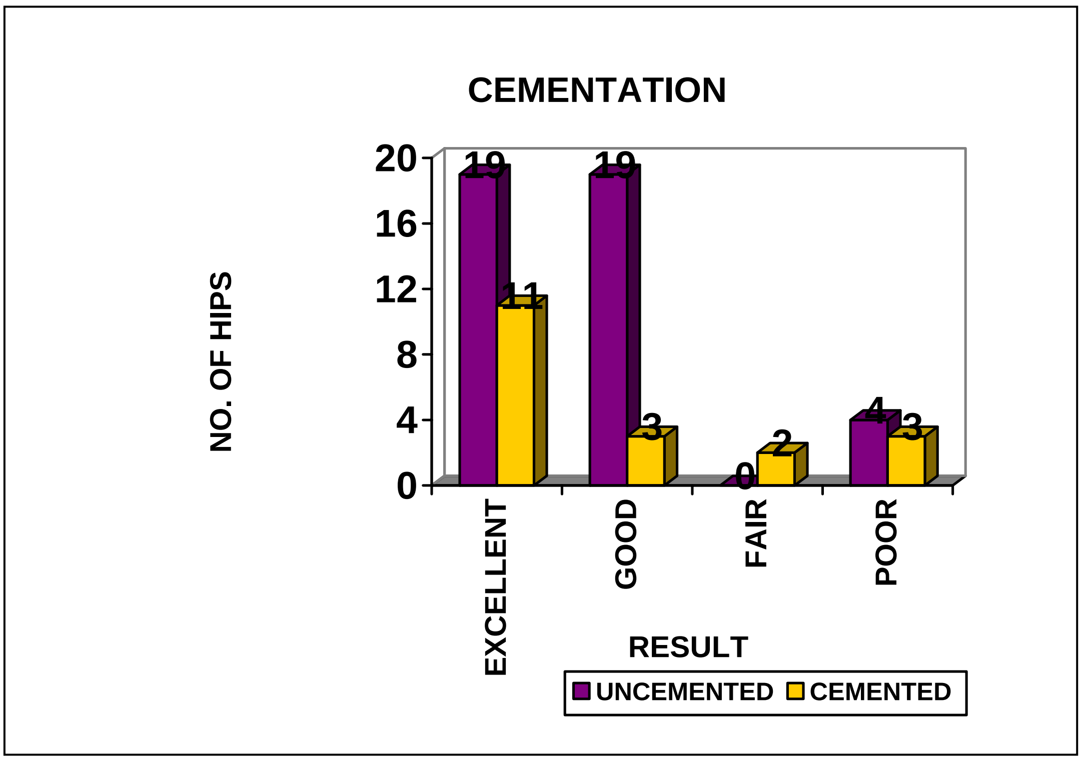

ARTHRITIC GROUP
7
7
2
2
AVN
OA
RA
INFE. SEQ
AVN
OA
RA
INFE. SEQ
INDICATIONS


APPROACH
45
18
LATERAL
POSTERIOR
LATERAL
POSTERIOR


FRACTURE GROUP
NO OF HIPS
15
12
9
6
3
0
13
11
12
1
0
0
1
3
EXCELLENT
GOOD
FAIR
POOR
RESULT
UNCEMENTED
CEMENTED

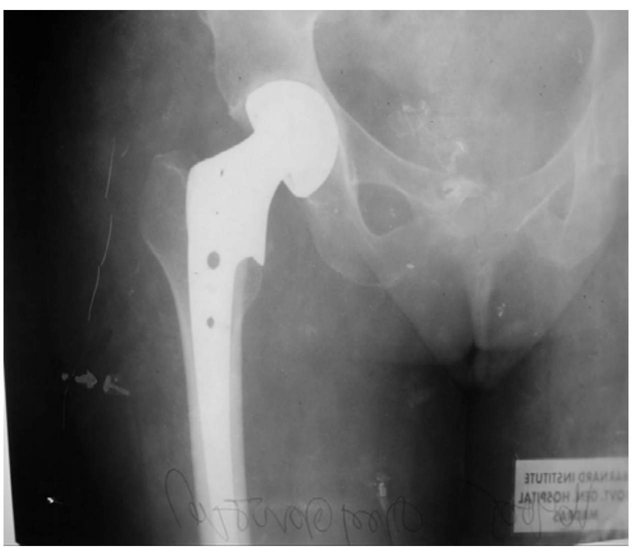

ARTHRITIC GROUP
NO OF HIPS
8
6
4
2
0
6
0
7
2
0
2
3
0
EXCELLENT
GOOD
FAIR
POOR
RESULT
UNCEMENTED
CEMENTED


COMPLICATIONS
NO OF HIPS
12
9
6
3
0
10
9
3
2
1
LLD
ATP
INF
FRAC
MALPOS
COMPLICATION


CEMENTATION
NO. OF HIPS
20
16
12
8
4
0
19
11
19
3
0
2
4
3
EXCELLENT
GOOD
FAIR
POOR
RESULT
UNCEMENTED
CEMENTED

CASE – 1

PRE OP **POST OP**

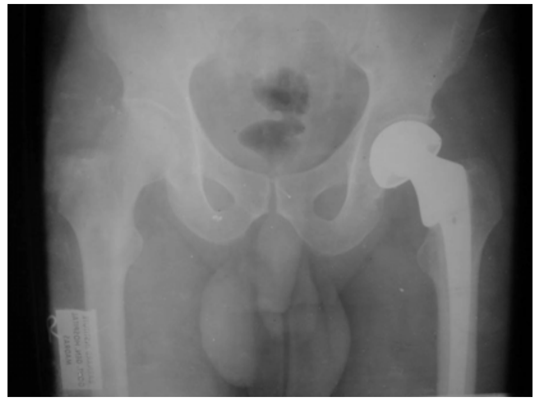


6 MONTHS FOLLOW UP

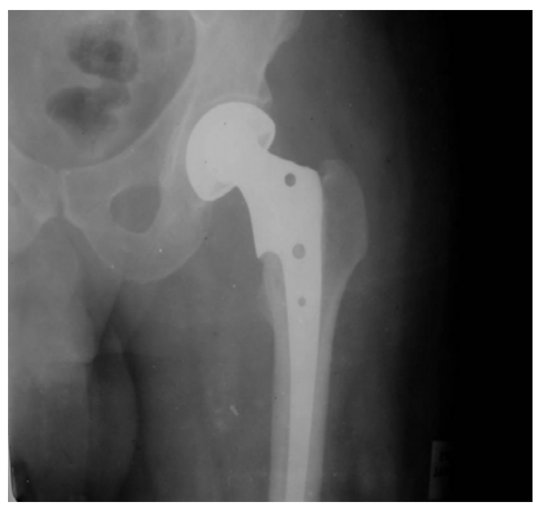
19MONTHSFOLLOW-UP

19 MONTHS FOLLOW UP - RANGE OF MOVEMENTS

CASE - 2



PRE OP **POST OP**



6 MONTHS FOLLOW-UP **19 MONTHS FOLLOW-UP**

19 MONTHS FOLLOW UP - RANGE OF MOVEMENTS

CASE – 3

PRE OP

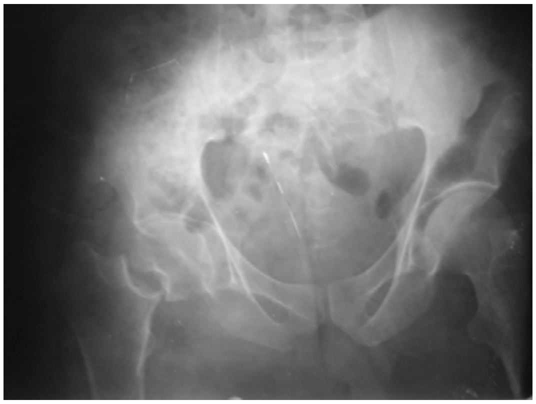
POST OP

5 MONTHS FOLLOW UP

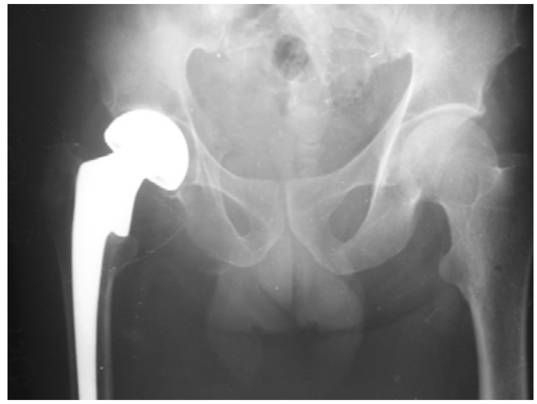
11 MONTHS FOLLOW UP

11 MONTHS FOLLOW UP - RANGE OF MOVEMENTS

CASE – 4



PRE OP



POST OP

5 MONTHS FOLLOW-UP

10 MONTHS FOLLOW-UP

10 MONTHS FOLLOW UP - RANGE OF MOVEMENTS

CASE - 5

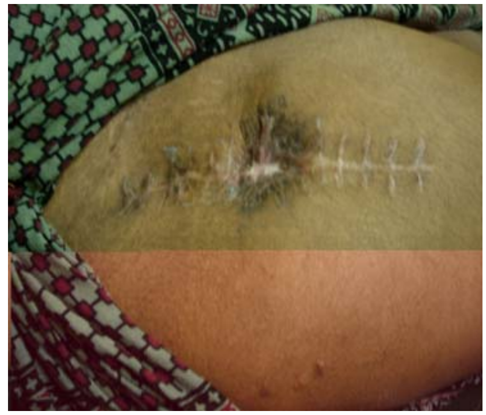
PRE OP

POST OP

6 MONTHS FOLLOW-UP

16 MONTHS FOLLOW-UP

COMPLICATIONS



INFECTION

TROCHANTRIC#

RETROVERSION

OF PROSTHESIS

LOOSENING & SUBSIDENCE

PROXIMAL FEMORAL#

MASTER CHART FOR ARTHRITIC GROUP

SL .NO	NAME	AGE	SEX	IP.NO	DIAGNOSIS	TREATMENT	APPR	COMP	HIP SCORE	Follo w up	RESULTS	REMARKS
1.	Mrs.Dhanalakshmi	42	F	697619	Rheumatoid arthritis Both hips	R uncemented Bipolar	Posterior	-	81	19	Good	-
2.	Mr.Durairaj	60	M	704203	AVN both hips	Cemented bipolar Both hips	Lateral	-	R – 89 L – 79	18 09	Good Fair	-
3.	Mr.Jemin	18	M	743129	JRA B/L bony ankylosis hips andknee	R uncemented Bipolar	Lateral	-	83	13	Good	-
4.	Mr.Kasipuli	50	M	746348	AVN both hips	B/L uncemented bipolar Both hips	Posterior Lateral	-	R – 92 L – 91	12 08	Excellent Excellent	-
5.	Mr.Manimaran	32	M	749948	Post infective sequelae R hip (arthritis)	R uncemented Bipolar	Lateral	-	93	11	Excellent	-
6.	Mrs.Revathy	26	F	753620	B/L arthritis hip	B/L Uncemented Bipolar	Lateral	-	R – 86 L – 88	12 06	Good	-
7.	Mr.Pattabhiraman	43	M	755851	Post infective sequelae L hip	L uncemented Bipolar	Posterior	-	96	10	Excellent	-
8.	Mr.Sathyaprakash	29	M	756678	B/L AVN	R uncemented Bipolar	Lateral	Infection		10		Removal
9.	Mr.Anbalagan	67	M	756803	Chronic arthritis L femur	L uncemented Bipolar	Lateral	-	85	10	Good	-
10	Mr.Sivasamy	47	M	762701	B/L AVN	R uncemented THR L uncemented Bipolar		Infection		09		Expired
11	Mrs.Jayanthi	46	F	763665	AVN R femur	R uncemented Bipolar	Lateral	-	97	09	Excellent	-
12	Mr.Vinayagam	53	M	767144	AVN L femur	L uncemented Bipolar	Posterior	Ant.thigh pain	82	09	Good	-
13	Mr.Narayanasamy	45	M	769730	Chronic arthritis R hip	R uncemented Bipolar	Lateral	-	96	09	Excellent	-
14	Mrs.Thangamani	35	F	784180	B/L AVN	L uncemented THR done R uncemented bipolar	Lateral Posterior	Excessive anteversion	60	07	Poor	Revision Cemented
15	Mr.Vetrayan	30	M	785601	Chronic arthritis R hip	R uncemented Bipolar	Lateral	Ant.thigh pain	86	07	Good	-
16	Mrs .Sakuntala	50	F	791179	Chronic arthritis R hip	R cemented Bipolar	Lateral		85	05	Good	-
17	Mrs.Perundevi	65	F	799163	Chronic arthritis L hip	L cemented Bipolar	Lateral	-	76	04	Fair	-

MASTER CHART FOR FRACTURE GROUP

Sl.No.	NAME	AGE	SEX	IP.NO	DIAGNOSIS	TREATMENT	APPR	COMP	HIP SCORE	Follow up	RESULTS	REMARKS
1.	Mr.Ramakrishnan	45	M	70229	# NOF L	L uncemented Bipolar	Posterior	-	88	19	Good	-
2.	Mrs.Sakuntala	42	F	705344	# NOF L	L uncemented Bipolar	Posterior	Ant.thigh pain	86	18	Good	-
3.	Mrs.Amalarajan	68	F	710070	# NOF L	L uncemented Bipolar	Lateral	-	98	18	Excellent	-
4.	Mrs.Jamuna	35	F	710946	Pathological # NOF L	L uncemented Bipolar	Posterior	-	89	18	Good	-
5.	Mr.Venkatesan	40	M	713366	#NOF R	R Cemented Bipolar	Lateral	-	28	18	Poor	-
6.	Miss.Jecintha	22	F	715897	Pathological # NOF R	R uncemented Bipolar	Lateral	Ant.thigh pain	89	17	Good	-
7.	Mrs.Kaveri	55	F	722240	# NOF L	L cemented bipolar	Posterior	-	97	16	Excellent	-
8.	Mr.Samuel	70	M	724049	# NOF L	L uncemented Bipolar	Lateral	-	85	16	Good	-
9.	Mr.Kannan	51	M	728169	# NOF R	R cemented Bipolar	Lateral	-	94	15	Excellent	
10.	Dr.Sivasami	65	M	732463	# NOF R	R cemented Bipolar	Posterior	-	99	15	Excellent	-
11.	Mr.Munuisamy	60	M	734393	# NOF L	L uncemented Bipolar	Posterior	-	96	14	Excellent	-
12.	Mrs.Kanagalaxmi	78	F	738585	# NOF L	L cemented Bipolar	Lateral	-	94	13	Excellent	-
13.	Mr.Danasekar	35	M	739974	# NOF R	R uncemented Bipolar	Lateral	-	99	13	Excellent	-
14.	Mrs.Saradha	72	F	740568	# NOF L	L uncemented Bipolar	Lateral	-	90	13	Excellent	-
15.	Mrs.Mookammal	40	F	743127	# NOF L	L uncemented Bipolar	Posterior	-	98	13	Excellent	-

Sl.No.	NAME	AGE	SEX	IP.NO	DIAGNOSIS	TREATMENT	APPR	COMP	HIP SCORE	Follow up	RESULTS	REMARKS
16.	Mr.A.B.Varma	53	M	744391	# NOF L	L cemented Bipolar	Lateral	-	94	13	Excellent	lost follow up
17.	Mr.Perumal	49	M	745507	# NOF R	R uncemented Bipolar	Lateral	-	99	13	Excellent	-
18.	Mr.Jeyavel	35	M	747011	Implant failure Cancellous screw fixation done #NOF R	Implant exit R uncemented bipolar	Lateral	Ant.thigh pain	80	11	Good	-
19.	Mr.Kumar	45	M	747683	# NOF R	R uncemented Bipolar	Lateral	-	99	11	Excellent	-
20.	Mr.Kasinathan	60	M	748464	A M prosthesis failure R hip	R uncemented Bipolar	Lateral	-	90	11	Excellent	-
21.	Mrs.Muthammal	85	F	749692	# NOF L	L uncemented Bipolar	Lateral	-		11		Expired
22.	Mr.Kanniappan	48	M	750007	# NOF R	R uncemented Bipolar	Lateral	Ant.thigh pain	89	11	Good	-
23.	Mrs.Viruthammal	45	F	752080	# NOF L	L uncemented Bipolar	Posterior	Ant.thigh pain	85	11	Good	-
24.	Mrs.Sulochana	64	F	752752	# NOF L	L cemented Bipolar	Lateral	-	94	11	Excellent	-
25.	Mr.Ulaganathan	42	M	755031	# NOF L	L cemented Bipolar	Lateral	-	97	10	Excellent	-
26.	Mr.Moorthy	35	M	755541	# NOF R	R uncemented Bipolar	Lateral	-	96	10	Excellent	-
27.	Mr.Arjunan	55	M	757728	# NOF L	L cemented bipolar	Posterior	-	97	10	Excellent	-
28.	Mrs.Rabiya	60	F	757874	# NOF R	R uncemented Bipolar	Lateral	Ant.thigh pain	86	10	Good	-
29.	Mr.Ravi	36	M	759675	Implant failure Cancellous screw fixation done #NOF R	Implant exit R uncemented bipolar	Lateral	-	80	10	Good	-

Sl.No.	NAME	AGE	SEX	IP.NO	DIAGNOSIS	TREATMENT	APPR	COMP	HIP SCORE	Follow up	RESULTS	REMARKS
30.	Mrs.Muniammal	70	F	762716	# NOF R	R cemented Bipolar	Lateral	-	99	9	Excellent	-
31.	Mrs.Mythyli	65	F	763477	# NOF R	R cemented Bipolar	Posterior	-	99	9	Excellent	-
32.	Mrs.Ponnammal	65	F	763600	# NOF R	R cemented Bipolar	Posterior	-	99	9	Excellent	-
33.	Mr.Velu	41	M	764755	# NOF R	R uncemented Bipolar	Lateral	-	96	9	Excellent	-
34.	Mrs.Meena	30	F	765409	# NOF R	R uncemented Bipolar	Lateral	Ant.thigh pain	86	9	Good	-
35.	Mr.Manickam	55	M	769542	# NOF R	R uncemented Bipolar	Lateral	Infection	0	9	Poor	Removal
36.	Mr.Kesavan	45	M	775862	AVN R femur Cancellous screw fixation done #NOF R	Implant exit R cemented bipolar	Posterior	-	63	8	Poor	-
37.	Mrs.Kasthuri	55	F	775965	# NOF L	L uncemented Bipolar	Lateral	-	87	8	Good	-
38.	Mrs.Jainambee	65	F	778437	# NOF L	L cemented Bipolar	Lateral		86	7	Good	-
39.	Mr.R.J.Kumar	44	M	786835	# NOF L	L uncemented Bipolar	Lateral	-	94	6	Excellent	-
40.	Mr.Jeyaraman	45	M	793580	# NOF L	L uncemented Bipolar	Lateral	-	92	5	Excellent	-
41.	Mrs.Saroja	55	F	823490	#NOF R	R cemented bipolar	Lateral		95	4	Excellent	-
42.	Mrs.Santhanamary	45	F	823934	#NOF R	R Uncemented bipolar	Posterior		93	4	Excellent	
43.	Mrs.Ponnammal	65	F	825693	#NOF R	R cemented bipolar	Lateral	# proximal femur	0	3	Poor	Revision